SOUTH FLORIDA WATER MANAGEMENT DISTRICT

2003 Executive Summary

EVERGLADES

Consolidated Report

January 1, 2003

sfwmd.gov

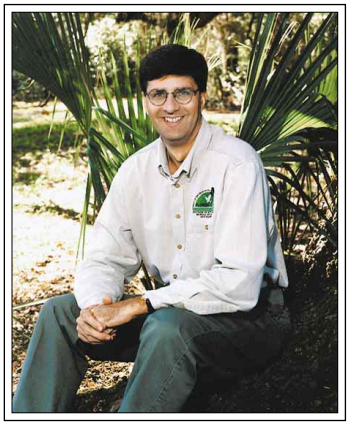
The South Florida Water Management District and the Florida Department of Environmental Protection are pleased to present the 2003 Everglades Consolidated Report. If there is an integrative theme in this year's Report, it is that resource management programs in the Everglades continue to make excellent progress toward achieving water quality and restoration goals. Agricultural Best Management Practices in combination with Stormwater Treatment Areas continue to perform above required levels of effectiveness in reducing phosphorus from water moving southward into the Everglades Protection Area. For the third consecutive year, wading bird nesting in South Florida was very successful, with an estimated 68,504 nests, up over 80 percent from last year's active nesting. The Comprehensive Everglades Restoration Plan is progressing on many fronts as dozens of projects are planned and implemented. The massive information base reflected in the 2003 Report continues to document the scientific soundness and strong performance of programs leading to Everglades restoration.

We find this positive theme very encouraging, but recognize that water management challenges lie ahead. A continuous process of improvement in water quality control programs must be sustained, and integration of many research, planning, regulatory and construction activities must be effective if we are to achieve water quality goals. Appropriate financial resources and completion of all these many activities are essential if we are to meet the ambitious 2006 time frame mandated by the Everglades Forever Act.

For the fifth consecutive year, systematic agency review and "peer review" by a panel of experts guided development of the 2003 Report. This quality assurance is reflected throughout the 2003 Report, which is attached to the back cover of this Executive Summary on a compact disc and contains hundreds of pages of data, findings and discussion in support of Everglades preservation and management.

This year, as in the past, the Report is the product of a unique interagency cooperative effort by both our agencies to satisfy diverse reporting requirements of the Everglades Forever Act and other state and federal laws. We are confident that this consolidated reporting effort will support prudent decision-making along the path to Everglades restoration.

Trudi K. Williams, P.E.
Chair, Governing Board
South Florida Water
Management District



David B. Struhs
Secretary
Florida Department of
Environmental Protection

Foreword

Once again, it is my pleasure to welcome you to the annual Everglades Consolidated Report. This is the fifth edition of the Report, which has been developed to convey updated information on Everglades Forever Act programs and permits, as it supports Everglades restoration and protection. The Report is the end product of superb teamwork and cooperation between individual scientists, engineers and other professionals in diverse organizational units across agencies. Building on earlier editions, more than 50 staff from the South Florida Water Management District and the Florida Department of Environmental Protection have created another truly remarkable source of useful information in one volume.

A team of professionals from the Environmental Monitoring and Assessment Department of the South Florida Water Management District guides the Report development process. The diverse readership of the Report owes these diligent workers a debt of gratitude for their thorough integration, skillful editing and unswerving dedication to follow this 2003 Report through to completion. They compile most of the data in the Report into a useful format, arrange for an external peer review panel and public workshop, edit the entire text and ensure that the Report is delivered on time to state officials.

I am certain the many improvements in both the breadth and depth of this year's Report have created a body of information that is even more useful and comprehensive. The authors have made a concerted effort to expand their chapter coverage in response to comments from peer reviewers and other readers. As in the previous four editions the *2003 Everglades Consolidated Report* meets legal mandates, but its ultimate goal is to give readers a realistic and evolving picture of agency progress on Everglades restoration and provide a valuable guide for resource management decisions. The complete *2003 Everglades Consolidated Report* with appendices has been made available on the attached compact disc and is on the District's Website at www.sfwmd.gov.

Naomi S. Duerr, P.G.
Director
Environmental Monitoring and Assessment Department
South Florida Water Management District

2003 Everglades Consolidated Report
The Bottom Line

Water Quality in the Everglades Protection Area

- Analysis of deviations (excursions) from water quality criteria by the Florida Department of Environmental Protection for Water Year 2002 (WY02) reveals that Everglades water quality generally meets state numeric criteria. Overall, concentrations of water quality constituents for WY02 were very similar to recent years.
- A return to more normal water conditions following the 2000-2001 drought resulted in lower concentrations of phosphorus over much of the Everglades Protection Area.
- During Water Year 2002, the Stormwater Treatment Areas and agricultural Best Management Practices continued to effectively reduce phosphorus concentrations and loads leaving the Everglades Agricultural Area. To date, these programs have removed over 1,300 metric tons of phosphorus that otherwise would have entered the Everglades.
- Mercury emissions into Florida's atmosphere have been reduced dramatically since 1990, and there is evidence that Everglades wetlands in some areas are responding with lower mercury concentrations in fish and wildlife.
- Although more information is needed on relationships between phosphorus enrichment, sulfur levels and mercury bioaccumulation, recent studies have shown that sulfur is a major factor in mercury transformation and accumulation in aquatic life. Marsh phosphorus levels play a relatively indirect and minor role.
- The District's Everglades Stormwater Program has progressed well in developing sound water quality improvement strategies for eight tributary basins to the Everglades Protection Area.
- Basin-specific Feasibility Studies are being conducted in 13 basins that discharge into the Everglades. These studies will evaluate alternative combinations of source controls and regional treatment to reduce phosphorus loading to the Everglades. The District will continue to work closely with private and public organizations and to integrate these efforts with those of the Comprehensive Everglades Restoration Plan.

Ecological and Hydrological Needs of the Everglades Protection Area

- "Cause and effect" studies in laboratories, greenhouses and field enclosures have defined the role of phosphorus in altering the natural flora and fauna of the Everglades. Results of these controlled investigations allow definitive interpretation of data collected from natural wetlands.
- Using information primarily from "reference sites" that developed along nutrient gradients in the Everglades, the Department has recommended approval of a phosphorus criterion of 10 parts per billion (ppb) as being protective of the natural flora and fauna without being overly protective or below the natural background levels.
- Lingering effects of the 2000-2001 drought have not been found in Everglades marshes.
- For the third consecutive year, nesting was very successful for several important species of South Florida wading birds, up over 80 percent from last year.
- Scientific investigation and model development on Everglades ecology, particularly on the effects of altered hydrology, are supporting the information needs of the Comprehensive Everglades Restoration Plan.
- Exotic plants and animals are a major threat to Everglades restoration, and though some control initiatives on exotic plants have made progress, more widespread success in controlling non-indigenous plants and animals will require integrated research and control programs by agencies throughout South Florida.

Performance of Agricultural Best Management Practices

- Best Management Practices continue to reduce phosphorus loads from the Everglades Agricultural Area to a greater extent (55 percent) than is required by the Everglades Forever Act (25 percent).
- Since 1994 the Best Management Practices Regulatory Program has prevented over 1,100 metric tons of phosphorous from moving south from the Everglades Agricultural Area into the Everglades. Information from continuing monitoring and research will be used to sustain or enhance this strong performance.

Comprehensive Everglades Restoration Plan (CERP)

- CERP involves over 50 complex and long-term projects to restore the quantity, quality, timing and distribution of water in South Florida. Implementation of CERP is progressing through acquiring lands, conducting pilot projects and feasibility studies, and developing essential project planning documents.
- The RECOVER team is developing an integrative program to measure and report progress toward CERP goals and is applying regional models to guide CERP decision-making.

Performance and Optimization of Stormwater Treatment Areas

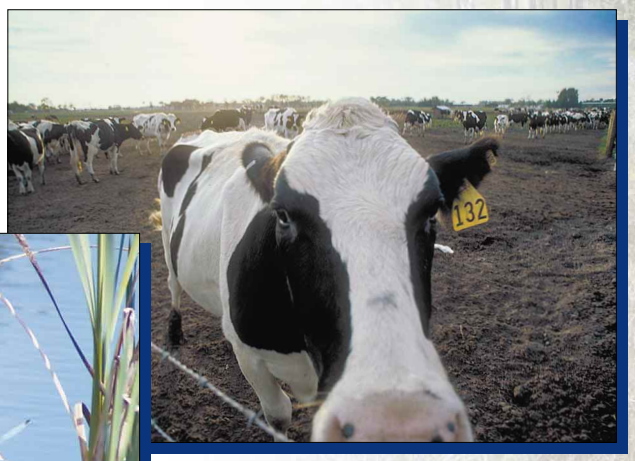
- Four of the six Stormwater Treatment Areas were fully operational in Water Year 2002, and the remaining two, STA-1 East and STA 3/4, are projected to be complete by October 2003.
- The STAs performed very well this year by removing 83 metric tons of phosphorus from inflows to the Everglades Protection Area. Since the initial STA began operation in 1994, over 200 metric tons of phosphorus have been removed from inflows to the Everglades.
- These constructed wetlands are proving to be consistently efficient in treating stormwater. This year, they removed an average of 71 percent of inflowing phosphorus and they released water at an average concentration below 40 ppb, well below the required 50 ppb.
- Expanded monitoring of Stormwater Treatment Area 2, cell 1 will provide detailed information on mercury dynamics and help to guide operational decisions in the future.
- Investigation of recent periods of dryout and manipulations of water conditions in the STAs have confirmed that these systems are resilient to depth changes and increased phosphorus loads. Additional investigations are necessary to fully optimize the phosphorus removal capabilities of the STAs.

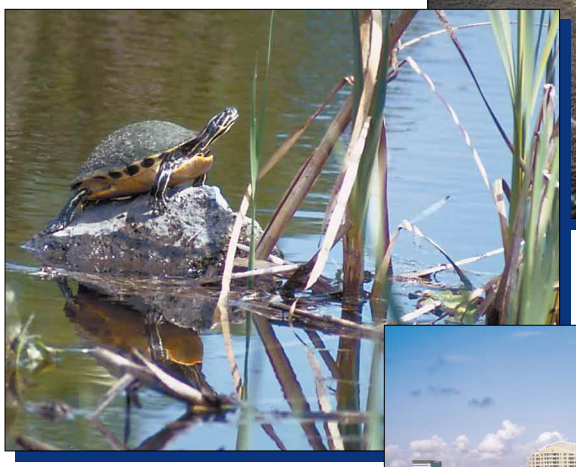
Advanced Treatment Technologies

- Ongoing analysis of Submerged Aquatic Vegetation confirms that this technology can reduce phosphorus concentrations to about 20 ppb, possibly lower under optimal conditions.
- Studies of Periphyton-based Stormwater Treatment Areas confirm the efficiency of these wetlands for phosphorus removal and indicate that the cost estimates of a full-scale system of this type is most sensitive to the depth of the limerock substrate added to the sediment and the cost of the required land area.
- While Chemical Treatment/Solids Separation is capable of reducing outflow phosphorus concentrations to 10 ppb or less on a small scale for short durations, aluminum and chloride levels are elevated relative to inflow concentrations.

Progress on Other Everglades Programs

- The District continued to aggressively acquire land for water resources; 21,254 acres were purchased in WY02, most of them intended to support the needs of CERP.
- To support the Everglades Construction Project in Fiscal Year 2002, *ad valorem* revenues provided nearly $35 million and agricultural privilege taxes provided almost $12 million.
- To meet the water supply needs of 2020, plans, construction projects, rule development and feasibility studies are being conducted under the Lower East Coast Water Supply Plan.





CHAPTER 1

Introduction to the 2003 Everglades Consolidated Report

Consolidation of Reporting Requirements Is Creating a Report Card on South Florida Environmental Management

The *2003 Everglades Consolidated Report* (Report) is adapted from earlier versions of the Report to meet the ever-changing reporting needs of the South Florida environment. The 2003 Report updates data and findings from Everglades research, monitoring and restoration activities to satisfy many reporting requirements in a single, integrated document, including the following:

- Two annual reports required by the Everglades Forever Act
- An annual report to the governor and the state Legislature on the Comprehensive Everglades Restoration Plan (CERP)
- Several state and federal reports required by permits from the U.S. Army Corps of Engineers and the Florida Department of Environmental Protection (Department) for the Stormwater Treatment Areas and for areas under the Everglades Stormwater Program

Beginning in 1999, the Report has received intensive review by a panel of seven external, independent experts and thorough discussion at public workshops. The Internet continues to be used as a means for conveying all comments on the Report, allowing the deliberative review process to be conducted in accordance with Florida's Government-in-the-Sunshine statutes. This scrutiny ensures that the Report communicates the best information available in support of Everglades programs.

Report Provides Technical Information and Status Summaries for Everglades Protection Area Programs

The entire *2003 Everglades Consolidated Report* and its extensive appendices are provided on the compact disc attached to this Executive Summary and on the District's Website at sfwmd.gov. This Executive Summary summarizes the main 2003 Report by highlighting key findings and links to major Everglades programs.

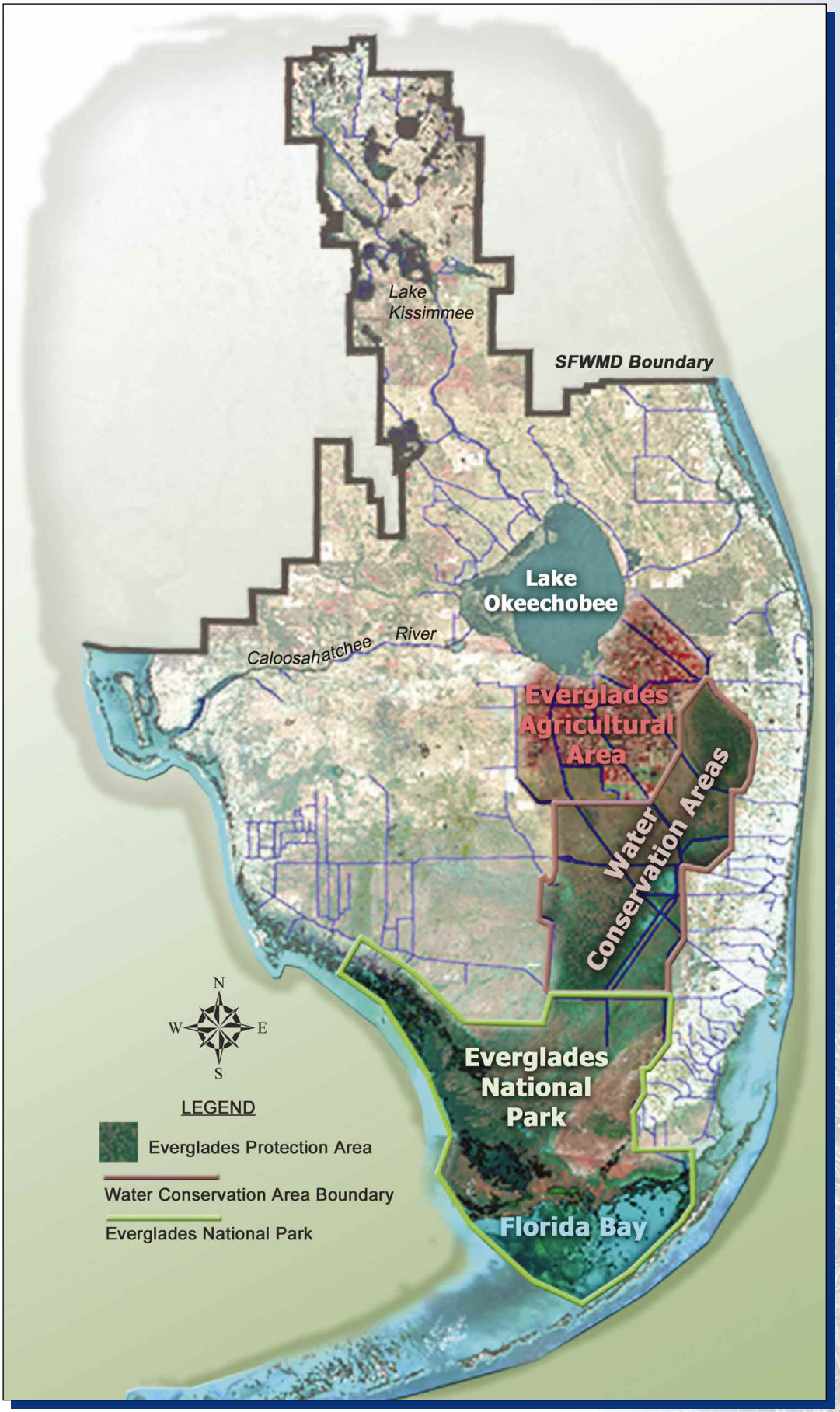
- The Everglades Best Management Practices Regulatory Program works in close cooperation with the agricultural industry to reduce the load of phosphorus moving southward from the Everglades Agricultural Area into Stormwater Treatment Areas and the Everglades Protection Area.
- Mandated by the Everglades Forever Act, the Everglades Construction Project includes six Stormwater Treatment Areas covering 47,000 acres. These constructed wetlands will treat nearly 1.4 million acre-feet per year of stormwater runoff from the Everglades Agricultural Area and other sources to improve the quality of water entering the Everglades Protection Area.
- In basins contributing to the Everglades Protection Area outside the Everglades Construction Project, the Everglades Stormwater Program supports water quality improvement strategies to ensure compliance with state water quality standards by December 31, 2006.
- The 2003 Report also provides expanded coverage of the far-reaching Comprehensive Everglades Restoration Plan (CERP) to restore, protect and preserve the South Florida Everglades ecosystem. The CERP includes more than 60 components and six pilot projects being implemented in close partnership with the U.S. Army Corps of Engineers.

Everglades Restoration Continues to Progress through Integrated Regional Programs

The Florida Everglades has been reduced to about 50 percent of its original extent, and its water supply has been modified dramatically in both quantity and quality. The quality of surface water inflows, particularly regarding the nutrient element, phosphorus, is a critical problem. The far-reaching impacts of these stresses, along with strategies for restoring the ecosystem, are evaluated throughout the Report.

Everglades restoration is unique in scale and complexity. With an aggressive timeframe and a cost in excess of $867 million, these efforts, mandated by the 1994 Everglades Forever Act, are highly ambitious. Everglades restoration programs continue to progress. The 2003 Report demonstrates that the scientific information base and environmental planning activities for Everglades restoration remain strong. Still, uncertainties remain in the administration, research, funding and optimization of restoration efforts that may prevent the District from achieving the mandate in the Everglades Forever Act to achieve compliance with all water quality standards by December 31, 2006. Ultimately, the technical information conveyed in this *2003 Everglades Consolidated Report* will contribute to the development of long-term, basin-specific solutions to water quality and quantity problems for all the areas discharging into the Everglades.

Major Everglades Areas



CHAPTER 2A

Water Quality in the Everglades Protection Area

Compliance with Water Quality Criteria in the Everglades Protection Area

Comprehensive water quality monitoring programs in the Everglades Protection Area (EPA) continued during Water Year 2002, from May 1, 2001 to April 31, 2002. The *2003 Everglades Consolidated Report* updates an evaluation of conditions affecting water quality in the region and provides a comprehensive assessment of water quality parameters not meeting Class III criteria during WY02.

WY02 represented a return to relatively normal hydrological conditions after the severe drought of the previous two years. This increased amount of water available to the ecosystem likely influenced the frequency of excursions for some water quality constituents over the course of the year.

Phosphorus Concentrations Decline as the Effects of the Recent Drought Subside

The status of the nutrient phosphorus is very important to the ecology of the Everglades Protection Area. The map on the following page summarizes phosphorus concentrations as geometric means (ppb) moving into, out of and within the Everglades Protection Area for Water Years 2001 and 2002. As expected, phosphorus concentrations continue to show a decrease from north to south in the EPA. Phosphorus levels at inflow stations to the Arthur R. Marshall Loxahatchee National Wildlife Refuge (Refuge) and Water Conservation Areas 2 and 3 for WY02 are lower than the historic period (WY78 through WY00) and also declined slightly from WY01 levels. During WY02, Everglades National Park (Park) inflow phosphorus concentrations returned to pre-drought conditions, with a geometric mean concentration of 9.1 ppb, close to the historic mean of 8.9 ppb. Interior marsh geometric mean phosphorus concentrations ranged from 4.8 ppb in the Park to 15.3 ppb in Water Conservation Area 2A. Looking at the Everglades Protection Area as a whole, 38 percent of phosphorus concentrations were at or below 10 ppb, up from the 24 percent recorded in WY01. Inflows to Everglades National Park showed a striking increase in phosphorus levels at or below 10 ppb, going from 49 percent in WY01 to 70 percent in WY02. These positive findings support the conclusion in the 2002 Report that drought conditions tend to increase phosphorus concentrations in inflows to Everglades National Park.

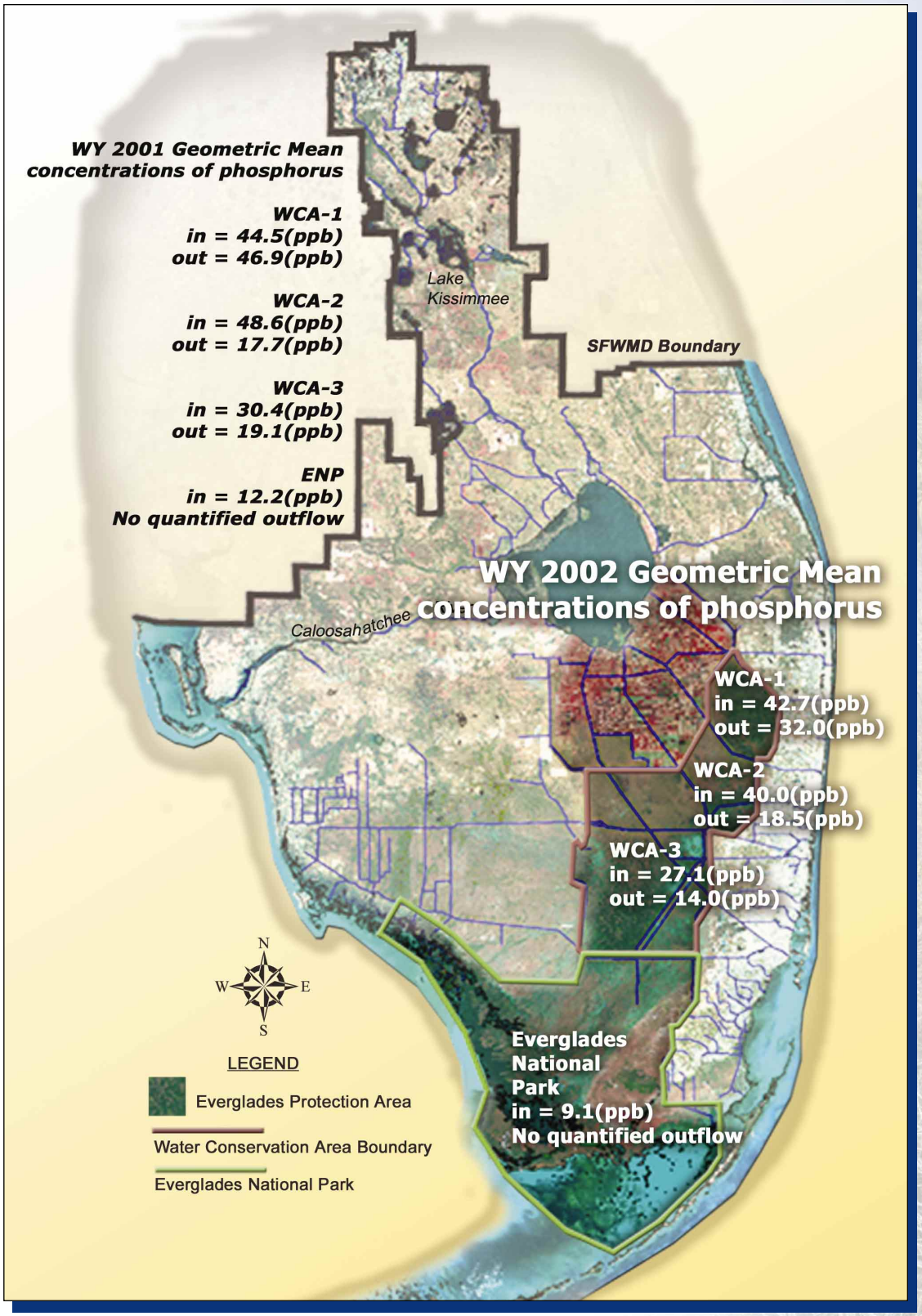
Water Quality Compliance in the EPA Remains Generally Very Good

Most water quality data collected in the Everglades Protection Area continue to meet Class III water quality criteria. However, as in previous years some excursions from criteria were identified, with their occurrence varying greatly across different regions of the Everglades Protection Area. Such regional differences are expected considering local environmental conditions and water management activities. As reported for WY01, excursions in WY02 were documented repeatedly for dissolved oxygen, alkalinity, conductivity and un-ionized ammonia. Evaluation of these occurrences supports the view that localized, natural conditions account for most excursions above water quality criteria. Although 15 pesticides were detected in water samples this year, atrazine, diazinon, endosulfan and simazine were the only compounds detected at levels exceeding chronic toxicity guidelines or water quality criteria for inflows to the Refuge and Water Conservation Area 2A, and this only infrequently.

Draft Site-Specific Criterion Helps to Sharpen the Separation Between Natural and Human-Induced Influences on Marsh Oxygen Levels

Overall, water quality conditions evaluated within the Everglades Protection Area for WY02 were similar to those observed previously. The Department recognizes these conditions to be natural characteristics of the Everglades Protection Area and does not consider these excursions to be violations of state standards. For example, dissolved oxygen was designated as a parameter of concern for all Everglades regions and classes due to ubiquitous concentrations below the current 5.0-ppm criterion. The Department has developed a Site-Specific Alternative Criterion (SSAC) that recognizes the naturally low dissolved oxygen characteristic of periphyton-dominated wetlands, such as the Everglades. Application of this draft

Phosphorus Concentrations in the Everglades Protection Area



SSAC to oxygen data collected during Water Year 2002 resulted in a reduction from 139 to 36 of the number of monitoring stations at which oxygen was identified as a concern. The oxygen regime at most of the remaining 36 sites can be shown to be depressed, either by nutrient enrichment or groundwater infiltration, and are accurately designated by the draft criterion as being below natural marsh background levels.

CHAPTER 2B

Mercury Monitoring, Research and Environmental Assessment

The South Florida Mercury Science Program Provides New Information to Guide Management Strategies

The problem of mercury in the Everglades has been evident since the late 1980s, when testing of largemouth bass revealed mercury levels that exceeded all health-based standards. At that time virtually nothing was known about mercury in Florida's environment, including its causes, effects, risks and potential solutions for minimizing the mercury problem. In response, the Department and the District organized a multi-agency group to understand the root causes of the mercury problem in Florida. Operating as the South Florida Mercury Science Program, this consortium has improved the predictive understanding of the sources, transformations and fate of mercury in the Everglades. The program has also been effective at linking local information to that at regional and global levels to better support decision making in South Florida and improve the estimation of mercury risks to fish-eating Everglades wildlife.

Atmospheric Mercury Is Magnified by Everglades Organisms

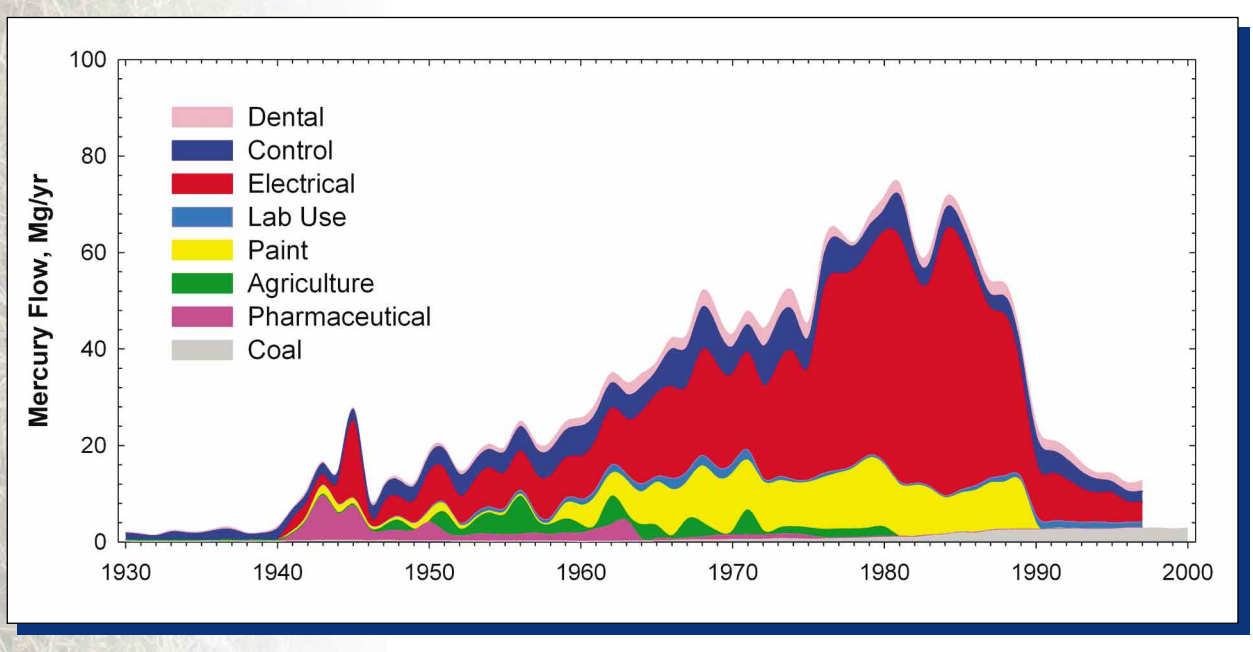
It is important to highlight key facts on mercury transformation, illustrated in the schematic on the following page. Methylmercury, the form found in fish and fish-eating animals, is primarily produced by bacteria in marsh sediments where oxygen is absent and the sulfate ion is present. Sulfate-reducing bacteria transform inorganic mercury into methylmercury as a byproduct of life processes. Methylmercury in water or food is readily absorbed into living tissue, by the process of bioaccumulation, much faster than it is released. This results in a magnification of concentrations in larger fish to levels millions of times higher than the surrounding water, even in areas distant from sources of surface water inflows. Methylmercury in animals and humans can be toxic to many organ systems and can have adverse effects on fetal development.

The Atmosphere Conveys the Mercury; the Marsh Creates the Problem

The South Florida Mercury Science Program has taught us that atmospheric deposition accounts for greater than 95 percent of the external load of mercury to the Everglades. Once deposited, the effect of newly deposited mercury is quickly felt through rapid methylmercury production occurring over a period of hours to days. The relative proportions of local and long-range transport of mercury to the Everglades remain an open question.

Recent studies have confirmed that sulfur and carbon are second only to mercury deposition rate in the control of methylmercury production and bioaccumulation. Marsh phosphorus levels play a relatively indirect and minor role by influencing the linkage between the carbon, oxygen, and sulfur cycles and the methylmercury production rate. These factors combine in the central and southern

Mercury Use in South Florida



Everglades, resulting in strong methylmercury production and bioaccumulation and, therefore, high mercury levels in fish and wildlife. These levels are high enough to pose a risk of chronic toxicity.

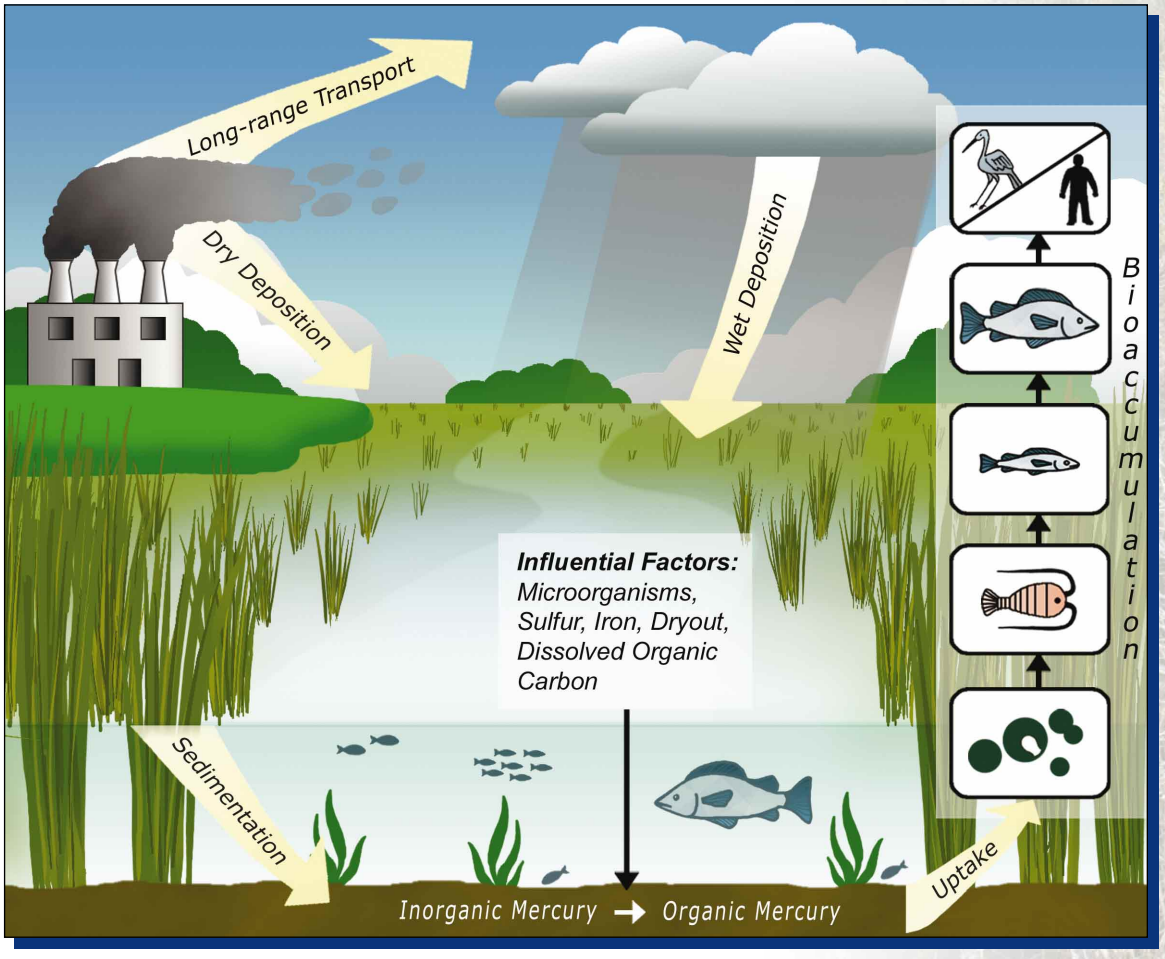
Reducing Mercury in the Atmosphere by National Source Controls Is Helping the Everglades, Though Continuing Research Is Needed

Emissions of mercury in South Florida since about 1990 were primarily from municipal and medical waste incineration and power generation. Thanks to a national program, mercury emissions from incinerators of all types have declined dramatically (about 99 percent) since the late 1980s. Principal reasons for this decline were reduced uses of mercury and effective emissions controls. Monitoring of fish and wading birds in South Florida indicates a significant decline in mercury in largemouth bass and wading birds by as much as 75 percent at some locations.

Environmental mercury models have been developed for the Everglades that incorporate the latest findings from atmospheric and aquatic research. Results substantiate a strong relationship between atmospheric mercury load to the Everglades and mercury levels in top predator fish. Modeling analyses indicate that response times of the Everglades to changes in atmospheric load are surprisingly short. Significant benefits could be expected within a decade of load reductions, with ultimate benefits occurring within about 30 years.

The mercury monitoring, research, modeling and assessment studies will continue through the multi-agency South Florida Mercury Science Program (SFMSP). This group of agencies, academic and private research institutions, and the electric power industry have advanced our understanding of the Everglades mercury problem faster and more effectively than what could have been accomplished individually by either the Department or the District. The goal of the SFMSP studies is to provide the Department and the District with information to make mercury-related decisions about the Everglades Construction Project, as well as other restoration efforts, on the schedule required by the Everglades Forever Act. The past successes of this program predict that future studies will provide an even better understanding of the Everglades as an "at-risk" system for mercury contamination and management options to reduce mercury levels.

The Everglades Mercury Cycle



CHAPTER 3

Performance and Optimization Research on Agricultural Best Management Practices

Nutrient-rich discharges from the Everglades Agricultural Area (EAA) have been identified as contributors to the enrichment of the Everglades and are the primary focus of the Everglades Regulatory Program and the Everglades Construction Project. Substantial efforts in Best Management Practices (BMP) implementation, research, and education have been directed at reducing phosphorus loading from the Everglades Agricultural Area basin. Together, these efforts are responsible for a trend in reduction of the loads and concentrations of phosphorus attributable to the Everglades Agricultural Area basin and conveyed to the Everglades Protection Area.

Best Management Practices Continue to Effectively Reduce Phosphorus Loading from the Everglades Agricultural Area

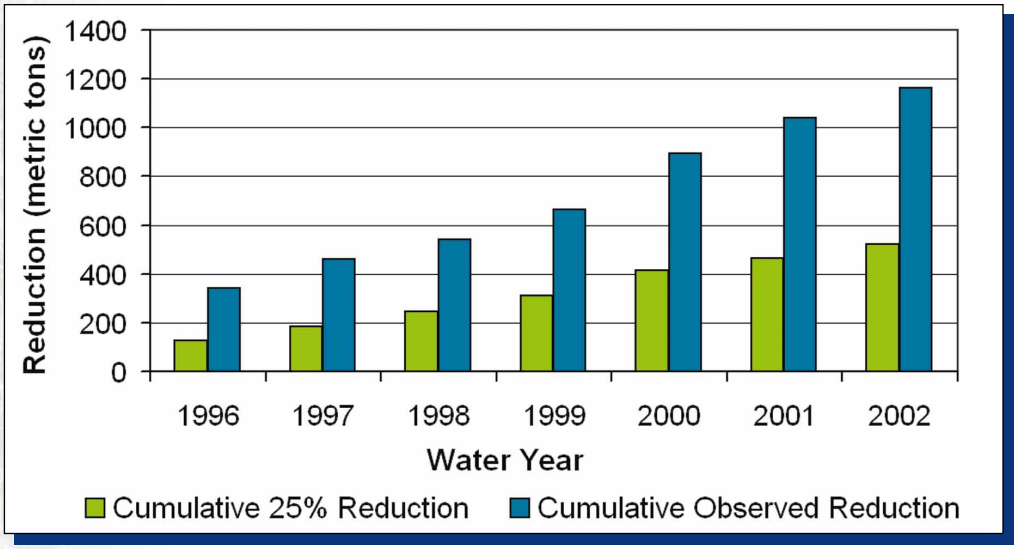
The overall effectiveness of BMPs is measured by annual phosphorus load reductions from the Everglades Agricultural Area basin since BMPs were implemented, as compared to a 10-year, pre-BMP base period. Load reduction is determined by comparing measured phosphorus discharges from District structures for each 12-month water year (May 1 through April 30) to the pre-BMP base period of October 1, 1978 through September 30, 1988. To factor out variability caused by rainfall, the base period phosphorus discharges are adjusted for the differences in the amount and distribution of rainfall for the current period. The rule requires the District to evaluate the data collected to assess the general trend in phosphorus load reduction, determine whether the EAA basin is in compliance with the phosphorus load reduction requirement, and publish the results annually.

The goal of the BMP regulatory program is to achieve a 25-percent reduction in phosphorus load from the EAA basin, and the basin has been in compliance since the first year of full BMP implementation (Water Year 1996). The phosphorus load discharged from the EAA basin for Water Year 2002 (WY02) was 101 metric tons as measured with BMPs in place. This amount should be compared to 227 metric tons of phosphorus that were predicted from the base period using a WY02 rainfall adjustment. The relative difference between the WY02 measured tonnage and the predicted base period tonnage (adjusted for rainfall) translates to a 55-percent reduction in total phosphorus load. In analyzing longer-term data trends, the three-year trend ending in WY02 equates to a 59-percent reduction of the phosphorus load from the EAA basin and a three-year, flow-weighted mean concentration of 92 parts per billion (ppb).

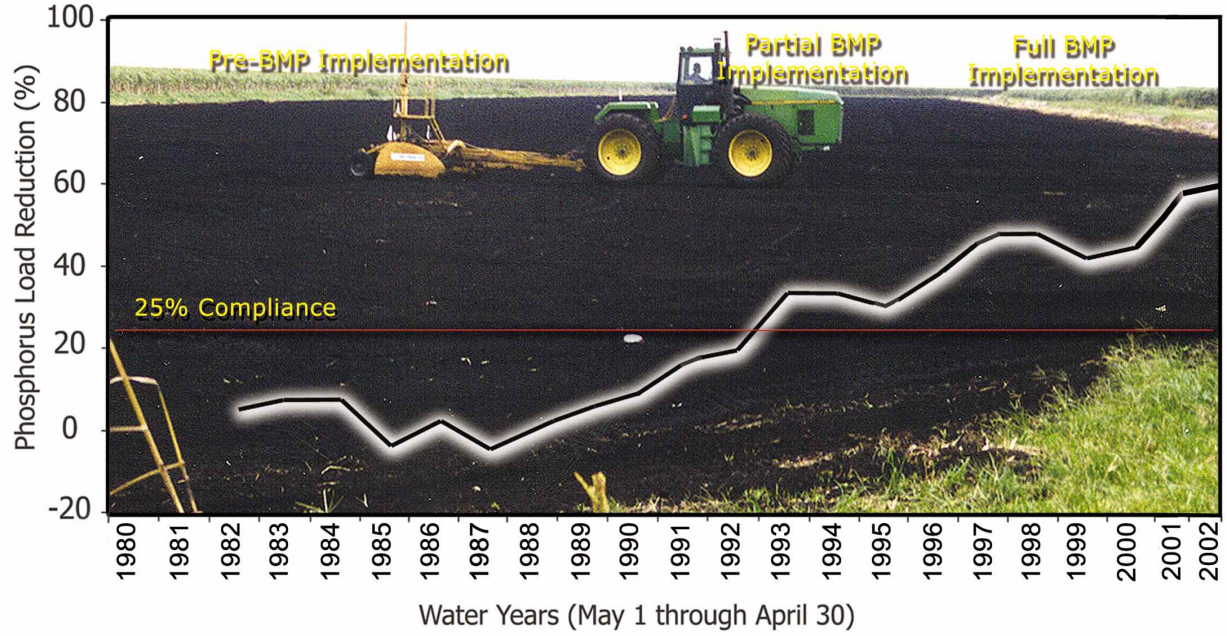
The BMP Regulatory Program Has Prevented Over 1,100 Metric Tons of Phosphorus from Entering the Everglades Protection Area

As the figure below demonstrates, the BMP Regulatory Program has not only out-performed its mandated 25-percent reduction goal, it has prevented over 1,100 metric tons of phosphorus

Phosphorus Loads Conveyed into the Everglades Protection Area



Phosphorus Load Reduction from the Everglades Agricultural Area



from leaving the EAA in discharges. Even with this excellent performance, a program of research, education and testing is continuing to ensure that long-term performance of BMPs as a phosphorus source control is maintained or enhanced. In addition to the Everglades Regulatory Program, EAA landowners are required to sponsor a program of BMP research, testing and education on the efficacy of BMPs. This has been accomplished through the University of Florida, Institute of Food and Agricultural Sciences and includes an Everglades Agricultural Area BMP farm-scale study. In addition to collecting data to assess the effectiveness of BMPs, research in the EAA includes identification of effects of BMPs on soils and crops, evaluation of specific conductance and dissolved phosphorus in farm discharges, and evaluation of particulate matter in farm and EAA drainage canals.

Results of Research by the University of Florida Provide Information to Further Our Predictive Understanding of Best Management Practices

University of Florida results continue to confirm that BMPs are highly effective in reducing phosphorus loads discharged from participating farms. Researchers conclude that additional reductions in phosphorus loading can only be achieved by continuing to analyze the mechanisms that contribute to BMP efficacy and optimization. From the study of particulate phosphorus transport, they concluded that the primary source of particulate phosphorus exported from the EAA is floating aquatic plants and related biological growth in the main farm canal system. However, the linkage between farm-level loads and the EAA basin loads has been difficult to establish because of the recycling effect caused by EAA basin canal water and individual farm discharges being drawn back into the farms for irrigation or freeze protection. The linkage is also confounded by other factors that influence phosphorus concentrations at the farm level. However, these data are used to optimize BMPs by making relative comparisons between water years for the same farm. Together, research, monitoring and education are expected to maintain or enhance BMP performance and to allow "lessons learned" to be applied to the Everglades Agricultural Area and other basins contributing to the Everglades Protection Area.

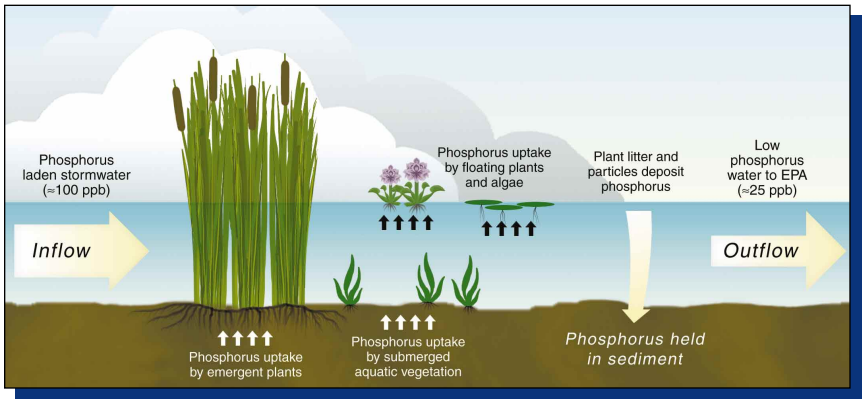
CHAPTER

4 Stormwater Treatment Areas and Advanced Treatment Technologies

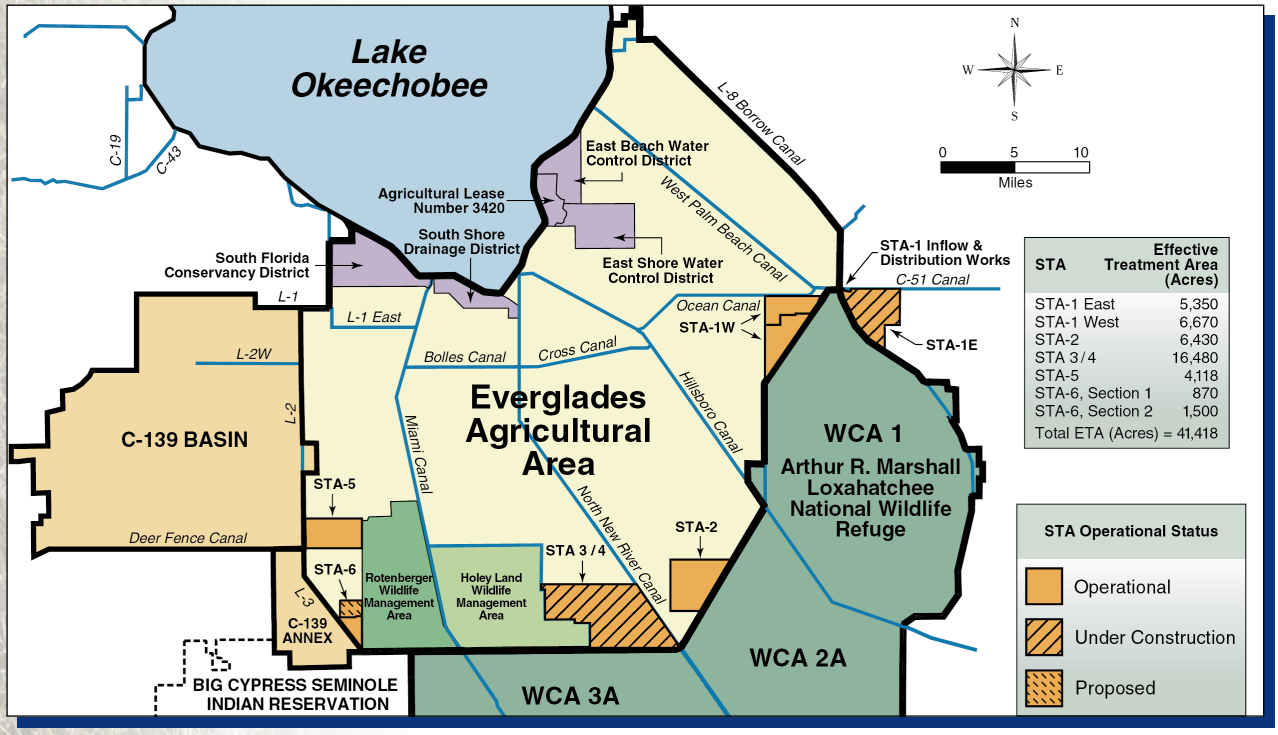
The 1994 Everglades Forever Act (EFA) set into motion an aggressive and comprehensive restoration program of construction, research and regulation projects designed to ensure that all waters discharging into the Everglades Protection Area achieve and maintain compliance with phosphorus and other water quality standards by December 31, 2006. Initial efforts have focused on implementation of effective Best Management Practices in the Everglades Agricultural Area and on the construction and operation of large, constructed wetlands referred to as Stormwater Treatment Areas (STAs). The STAs are being constructed under a fast-moving effort called the Everglades Construction Project. Their locations are shown on the map on this page.

As illustrated by the above diagram, STAs function by accumulating phosphorus in their sediments through biological and chemical wetland processes. At the time the 1994 EFA was passed, there was general consensus that the constructed wetlands would reduce phosphorus levels to around 50 parts per billion (ppb), and as such would not be sufficient to achieve the long-term phosphorus standard for the Everglades. The Everglades Forever Act required that the District conduct research to optimize the performance of the STAs and investigate potentially superior technologies referred to as Advanced Treatment Technologies (ATTs). During Water Year 2002, the District continued to make significant progress in the construction, operation and optimization of the STAs and conducted critical research on ATTs. All these topics are included in the three sections of Chapter 4.

STA Performance



Everglades Construction Projects



CHAPTER

4A Stormwater Treatment Area Performance and Compliance

Information from STA operations, vegetation dynamics, phosphorus levels and water quality compliance was evaluated for WY02 and was compared to earlier years to assess STA performance and compliance. Data on nutrients, dissolved oxygen, pesticides and mercury were summarized to document compliance with state and federal permit conditions.

The Stormwater Treatment Areas Are Highly Effective at Removing Phosphorus from Stormwater

Four of the six STAs (STA-1 west, STA-2, STA-5 and STA-6, section 1) were operational during WY02 and removed 83 metric tons of phosphorus from stormwater that otherwise would have gone into the Everglades Protection Area. This was a marked increase from WY01, when, due to drought conditions, the STAs treated far less water and removed only 24 metric tons of phosphorus. During WY02 the STAs continued to be efficient at removing phosphorus. They retained an average of 71 percent of inflowing phosphorus and decreased concentrations to an average below 40 ppb, well below the long-term design target of 50 ppb. Since 1994 the STAs have reduced phosphorus loads by approximately 198 metric tons.

Aerial view of STA-6

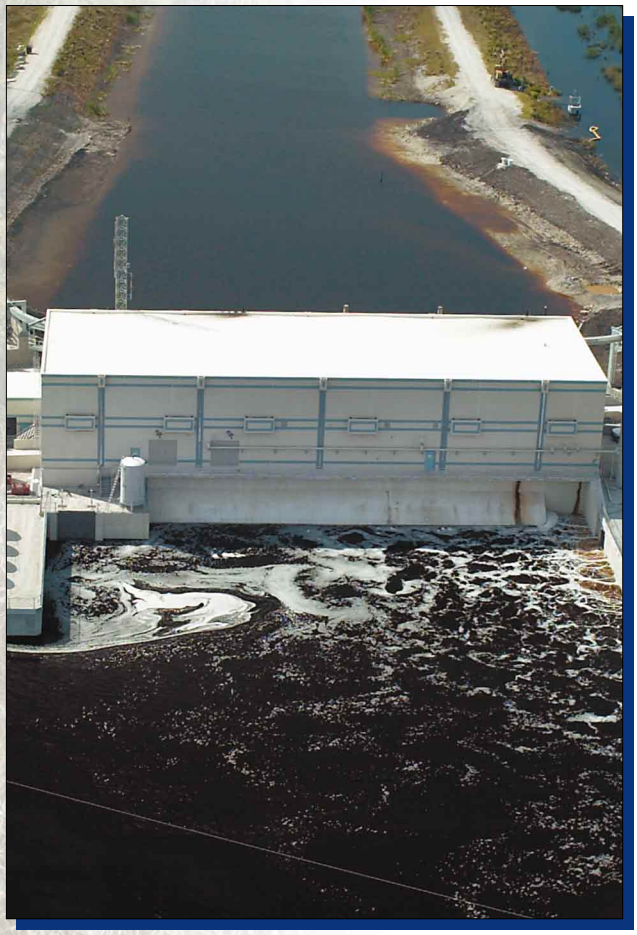
Though the STAs Are in Full Compliance with State Operating Permits, Uncertainties Remain in Long-term Performance and Mercury Dynamics

Water quality monitoring within and downstream of the STAs demonstrated that the four operational STAs are in full compliance with state operating permits. However, these constructed wetlands have unique characteristics. While STA-2, cells 2 and 3 achieved their mercury start-up criteria in September and November 2000, respectively, at the end of this reporting year, cell 1 still had not. In August 2002 the South Florida Water Management District (District) was issued a permit modification to allow cell 1 to operate in a flow-through mode, which is expected to reduce methylmercury production and bioaccumulation rates by altering cell hydrology and surficial sediment chemistry. Expanded monitoring is being conducted to better understand the causes of excessive methylmercury production and identify short- and long-term measures to address this concern.

CHAPTER

4B Stormwater Treatment Area Optimization

Optimization of the nutrient removal performance of the Stormwater Treatment Areas (STAs) is required by the Everglades Forever Act. As a result, the District conducts research and monitoring programs to sustain or enhance the nutrient removal performance of these constructed wetlands. Information is derived from operational experience, from analysis of performance data, from experiments in test cells and small-scale mesocosm experiments, from analysis of information on other wetlands, and eventually through simulation of operational scenarios using a dynamic water quality model.



G-310 outflow pump station at STA-1 West

Influence of Hydrology on Wetland Treatment Performance Was a Focus of This Year's Optimization Research

This year has been a productive one for optimization research, with a primary focus on the hydrologic aspects of wetland treatment performance. To reduce uncertainty in the water and phosphorus budgets for STA-1W, cell 5, the District is resurveying the elevations of newly constructed water control structures to verify stage calculations and flow equations and improve estimates of flow. Also, automatic samplers are being installed to improve estimates of inflow and outflow phosphorus concentrations. These measures are essential to accurately assess the performance of STA-1W.

The high- and low-depth experiments conducted at the STA-1W north test cells resulted in a slight increase in phosphorus removal. The substantial changes in water retention time that resulted from altering depth did not cause a marked increase in mean outflow concentration in these experiments. Prior experiments on water residence time found a change in outflow concentration as water was added to the test cell and as the loading rate for phosphorus increased. However, inflow phosphorus concentrations were relatively low for the depth experiments, making comparisons with other experiments difficult. Taken together, the results of these trials indicate that water depth in cattail-dominated wetlands that receive relatively high inflow phosphorus concentrations, such as at the front end of a treatment wetland, is apparently not an important operational constraint; rather, phosphorus loading has a much greater influence on treatment performance.

The Performance of STA-5 Remained Efficient Despite Greatly Increased Phosphorus Inputs for Water Year 2002

Total phosphorus loading to STA-5 was almost three times higher in WY02 compared to WY01 (18,338 versus 54,140 kg). Also, the south flow-way received more phosphorus than the north flow-way in both years. The difference between flow-ways was influenced by the Deer Fence canal that discharged into the south flow-way. Despite the differences in annual phosphorus loading, STA-5 removed proportionately more phosphorus in WY02 than in WY01 (68 versus 58 percent of inflow phosphorus) and had a markedly lower average outflow phosphorus concentration (73 versus 154 ppb, respectively). The increase in treatment performance in WY02, despite greater phosphorus inputs, was attributed to the further development of the wetland plant community in STA-5 during the study period.

CHAPTER

4C Advanced Treatment Technologies

The District is nearing the conclusion of an ambitious research program for testing the ability of several Advanced Treatment Technologies (ATTs) to remove phosphorus from waters entering the Everglades Protection Area (EPA). The purpose of this research program is to identify technologies that will meet the long-term water quality goals for the Everglades. In accordance with the Everglades Forever Act, these treatment technologies are being evaluated based on phosphorus load reduction, phosphorus discharge concentration reduction, distribution and timing of water delivery to the EPA, compliance with water quality standards, compatibility of treated water with aquatic flora or fauna, cost-effectiveness, and schedule for implementation. Other evaluation criteria include technical and scale-up feasibility, possible adverse environmental impacts and local acceptability. Overall, current studies have provided the information needed to meet the Everglades Forever Act requirement that "... discharges into the Everglades Agricultural Area canals and the EPA prevent an imbalance in the natural populations of aquatic flora or fauna in the EPA and provide a net improvement in the areas already impacted."

Based on ATT research completed to date, it is clear there are two classes of treatment technologies that may be used to meet the long-term water quality requirements of the Everglades:

Biological treatment technologies - includes Submerged Aquatic Vegetation and Periphyton-based Stormwater Treatment Areas

Chemical treatment technologies - includes microfiltration, Chemical Treatment/Solids Separation (CTSS) and other chemical treatment vendor technologies.

Current findings for each ATT project are summarized below.

Submerged Aquatic Vegetation

The study over the past year of Submerged Aquatic Vegetation as a treatment technology has been focused at the field-scale level using test cells and Stormwater Treatment Area 1W, cells 4 and 5. Progress has also been made on development of a process model for comparative analysis and a scale-up exercise, as well as comparative studies of long-term retention rates found in natural systems. Generally, the treatment/test cells that received higher phosphorus loading had higher sediment phosphorus concentrations and accrual rates. In hard water, phosphorus tended to be bound in relatively stable forms associated with calcium. Based on output from the Submerged Aquatic Vegetation model and the demonstrated long-term performance of STA-1W, cell 4, a wetland with a healthy Submerged Aquatic Vegetation community can be expected to reduce phosphorus concentrations to about 20 ppb. Additionally, using a two-year period of optimal performance of STA-1W, cell 4, in combination with improved system hydraulics, the model forecast an outflow phosphorus concentration of 14 ppb under these restrictive conditions.

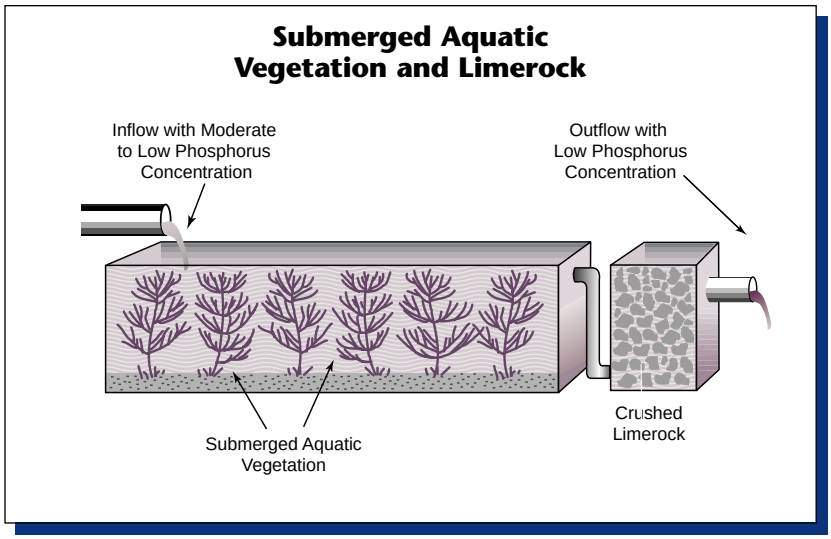
Test cells being used for Advanced Treatment Technologies research in STA-1W

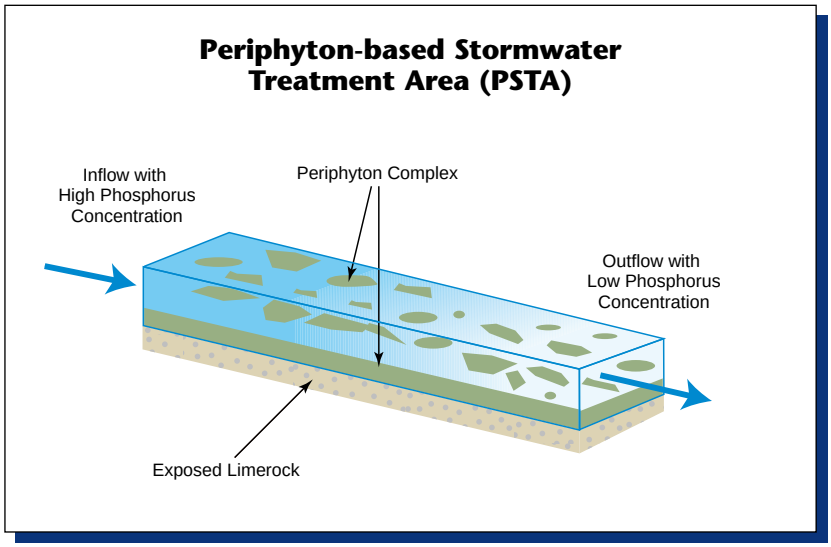
Periphyton-based Stormwater Treatment Area

Phase 2 of the Periphyton-based Stormwater Treatment Area (PSTA) research study, which included model development and scale-up cost estimates, has been completed, and Phase 3 monitoring of an 8.1-ha (20-acre)

Advanced Treatment Technologies (cont.)

field-scale demonstration project was begun. Test cell research has shown that with an average inflow phosphorus concentration of 23 ppb, a mean outflow concentration of 12 ppb was sustained for over a year in a shellrock-based PSTA system. Based on modeling and performance data, the predicted area required by a PSTA system is most sensitive to sediment nutrient levels and wetland hydraulic efficiency. The cost estimates of the PSTA system derived from the scale-up studies were most sensitive to the depth of limerock added and the cost of additional land area. Preliminary monitoring data from the field-scale system indicated that groundwater seepage might be a significant factor in the phosphorus removal performance of a full-scale system.



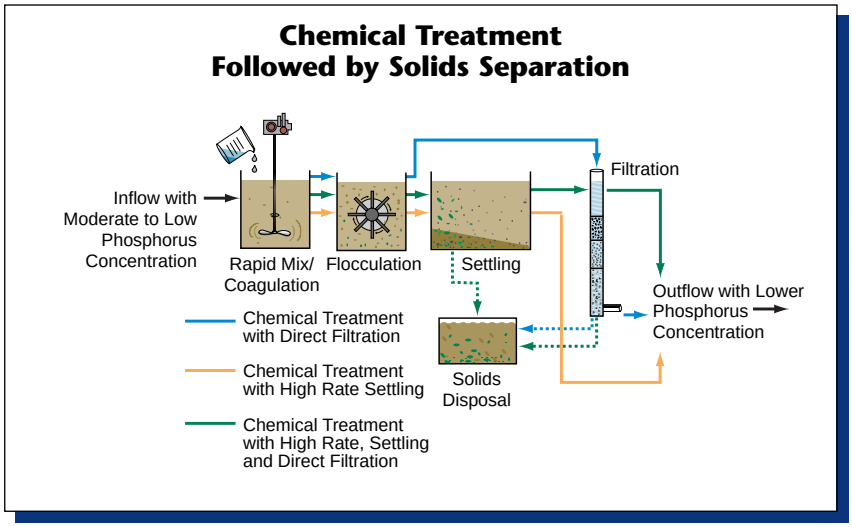


Chemical Treatment/Solids Separation

The District operated a pilot-scale facility for Chemical Treatment/Solids Separation within the C-11 basin for more than two months in 2001. Additionally, the District operated a larger facility with this technology located at the STA-1W north test cells in combination with a Submerged Aquatic Vegetation-dominated wetland. The unit located at the C-11 basin produced phosphorus outflow concentrations less than or equal to 10 ppb in seven of eight trial runs. However, the aluminum and chloride concentrations in the outflow of the treated C-11 runoff were greater than the respective inflow concentrations. On average, the Chemical Treatment/Solids Separation process removed 99 percent of fecal coliform bacteria, and reduced alkalinity, color, iron, reactive silica, nitrogen, organic carbon and turbidity relative to inflow concentrations. The unit located at the STA-1W north site test cells reduced average inflow phosphorus concentrations from 73 ppb to 9 ppb, while the mean outflow from the Submerged Aquatic Vegetation wetland was 15 ppb. Total aluminum and chloride concentrations from the unit were higher than inflow concentrations. This was attributed to the addition of 20 ppm of aluminum chloride as the coagulant.

Supplemental Technology Standard of Comparison

The Supplemental Technology Standard of Comparison ensures treatment technologies can be compared with each other objectively and consistently. The Chemical Treatment/Solids Separation project was the first to complete evaluation by the standard of comparison and the results were presented in Chapter 4 of the *2002 Everglades Consolidated Report*. The results of the PSTA and Submerged Aquatic Vegetation evaluations are presented in the 2003 Report. The comparison of technologies identified and addressed the following nine evaluation concepts:



Primary Evaluation Concepts

- The level of TP concentration reduction achievable by the technology (as determined from experimental data)
- The level of TP load reduction (as derived from model data)
- Compatibility of the treated water with the natural populations of aquatic flora and fauna in the Everglades
- Cost-effectiveness of the technology
- Implementation schedule

Ancillary Evaluation Concepts

- Feasibility and functionality of the full-scale design and cost estimates
- Operational flexibility
- Sensitivity of the technology to fire, flood, drought and hurricane
- Level of effort required to manage and the potential benefits to be derived from side streams generated by the treatment process.

Future Research

The District will continue investigating all promising technologies in an effort to further reduce outflow phosphorus concentrations from the Stormwater Treatment Areas. The monitoring of the Periphyton-based Stormwater Treatment Area and Submerged Aquatic Vegetation test cells located at STA-1W will also continue, along with monitoring of the Periphyton-based Stormwater Treatment Area field-scale site. The District has entered into a cooperative agreement with the University of Florida to investigate several methods of mineralizing the dissolved organic phosphorus in effluent from Stormwater Treatment Areas in an effort to further reduce outflow phosphorus concentrations. Additionally, the District is moving forward with a field-scale Chemical Treatment/Solids Separation demonstration project located in the village of Wellington to better assess the costs of the chemical treatment process and evaluate its ability to consistently reduce urban stormwater phosphorus concentrations to less than 10 ppb.

The District will continue analysis of long-term trends in the Stormwater Treatment Areas to provide a basis for improving their treatment performance. To achieve this goal, it is necessary to understand why each of the areas performs differently and how the various biological and physical components, such as the plant community and sediments, influence phosphorus removal. The District will also continue monitoring the operation and performance of several full-scale Submerged Aquatic Vegetation treatment systems.

Funding

It must be stated that to date, no dedicated funding has been identified for implementation of any Stormwater Treatment Area optimization measures or for the implementation of Advanced Treatment Technologies that may be necessary by 2006 to meet the long-term water quality standards for waters discharging into the EPA.

CHAPTER 5

Development of a Numeric Phosphorus Criterion for the Everglades Protection Area

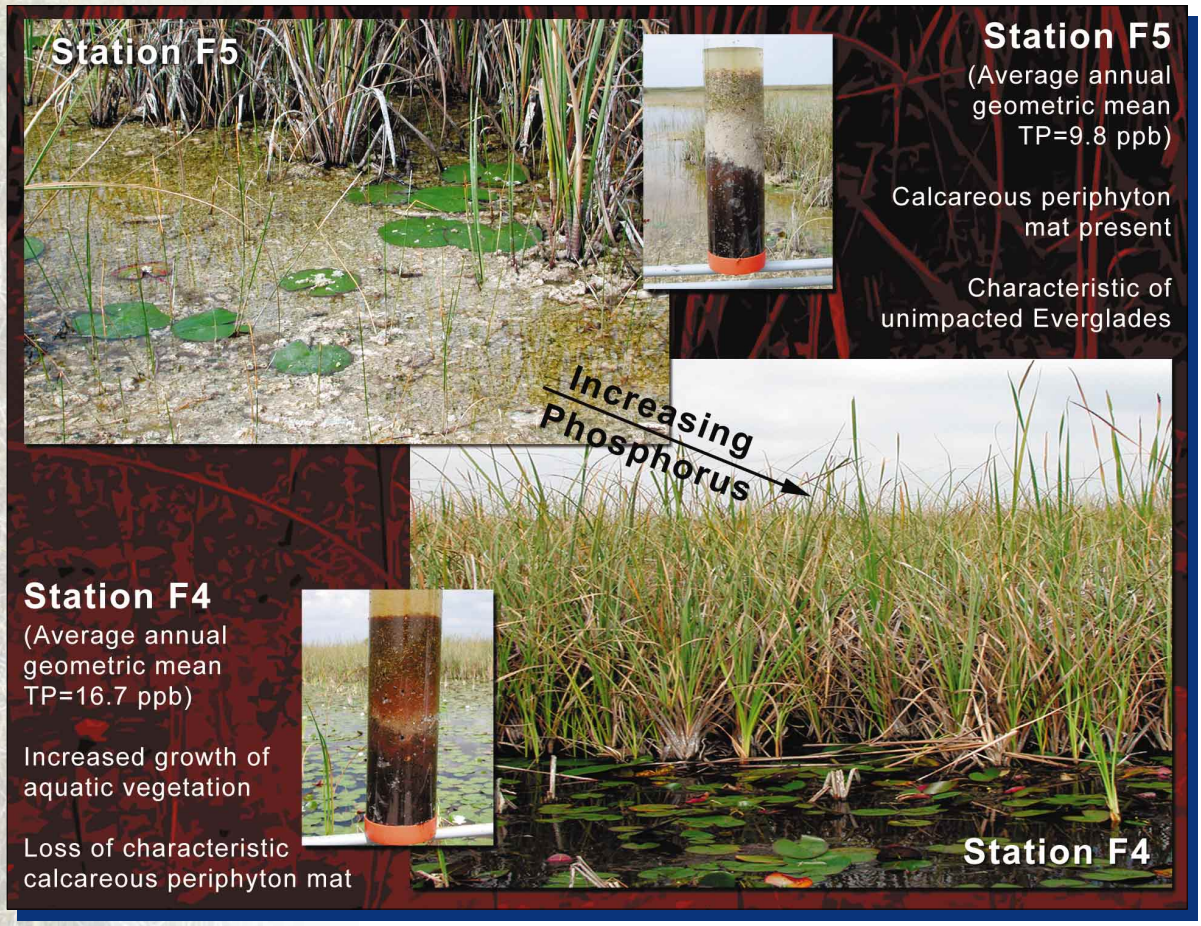
To begin restoration of the remnant Everglades, the Everglades Forever Act requires the Florida Department of Environmental Protection (Department) to establish a numeric phosphorus criterion for the Everglades Protection Area. The Department has conducted extensive evaluations of chemical and biological data from multiple levels in the Everglades food web to derive and support a numeric phosphorus criterion for the Everglades Protection Area. The results of these data analyses have been presented in earlier versions of the Everglades Consolidated Report.

The Department Relied Heavily on Information from Studies Along Man-Made Nutrient Gradients in the Everglades Protection Area

Derivation of a numeric criterion relied primarily on data collected by the District along a series of transects traversing existing man-made phosphorus gradients in each portion of the Everglades Protection Area. Using gradients in these natural areas provides an excellent opportunity to study what happened to the natural biological communities in the marsh as the result of long-term phosphorus enrichment over large spatial scales. However, since other variables can also change along the phosphorus gradients and have the potential to affect the natural flora and fauna, data collected from the District's experimental dosed mesocosms were used to establish cause-and-effect relationships between observed biological changes and phosphorus enrichment.

The Department employed a "reference site" approach during the evaluation and analysis of the District's gradient transect data. The reference site approach is widely accepted for deriving water quality criteria and is efficient in using the

Effects of Phosphorus Enrichment



established, long-term gradients in the Everglades. Extensive analyses of biological and chemical data from WCA-2A and the Arthur R. Marshall Loxahatchee National Wildlife Refuge (Refuge) were used to differentiate a group of reference stations at which the natural biological communities exhibit minimal changes in structure and function as a result of enrichment. The phosphorus enrichment illustration on the preceding page depicts a "reference" site (F5) in comparison to an "imbalanced" site (F4) at which adverse changes have occurred. The phosphorus regimes observed at the reference sites were then used as the basis for the derivation of a phosphorus criterion that would be protective of the natural biological communities. Reference sites in Water Conservation Area 2A and the Refuge exhibit annual geometric means ranging from 5.5 to 11.7 parts per billion (ppb). The Department's analyses also indicate that the normal structure and function of the natural biological communities in these two areas are adversely altered at similar levels of enrichment.

Extensive Everglades Data Support a Phosphorus Criterion of 10 ppb as Being Protective of Everglades Flora and Fauna Without Being Overly Protective

Further statistical analyses of the phosphorus data from the Refuge and Water Conservation Area 2A indicate that the maintenance of a long-term average annual geometric mean total phosphorus concentration at or below 10 ppb would be protective of the natural flora and fauna without being overly protective or below natural background levels. Additionally, results of similar evaluations of limited data available for Water Conservation Area 3A and Everglades National Park indicate that these areas exhibit a similar response to phosphorus enrichment. Therefore, a numeric phosphorus criterion of 10 ppb measured as a long-term geometric mean would be protective of the natural flora and fauna throughout the Everglades.

The adoption of a 10-ppb phosphorus criterion is further supported by the comprehensive literature review conducted by the United States Environmental Protection Agency during its evaluation of the Miccosukee Tribe's proposed 10-ppb criterion. Additionally, the Department's evaluation of the results of the Duke University Wetland Center Everglades dosing study clearly indicates that the center's recommended 15.6-ppb criterion would not be adequately protective of the natural aquatic flora and fauna.

Based collectively on these findings, the Department filed a notice of rulemaking in December 2001 and recommended a 10-ppb phosphorus criterion for approval by the Environmental Regulation Commission. The commission is currently conducting a series of hearings to establish the phosphorus criterion by rule.

A Standard for the Everglades Protection Area Must Also Specify a Measurement Methodology

The Department is developing a measurement methodology for the phosphorus criterion that will track maintenance of a long-term average phosphorus concentration to protect against imbalances in the natural flora and fauna, and will have an annual concentration upper limit that allows for natural temporal and spatial variation. The Department proposes to report the results of criterion monitoring for marsh stations representative of the receiving waters in the Everglades Protection Area and dispersed throughout areas that are both impacted and unimpacted by phosphorus enrichment.

The final measurement methodology must provide for an objective and scientifically reliable assessment of the phosphorus status of the Everglades Protection Area. In addition, it must take into account natural spatial and temporal variability, as required by the Everglades Forever Act. Finally, it must allow the criterion to be applied so it protects the natural biological communities within the Everglades without being below background levels.

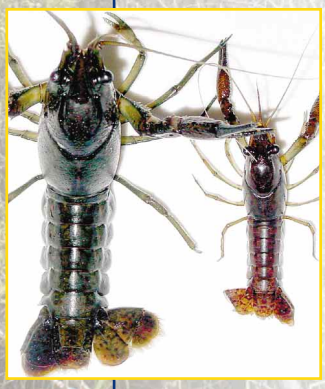
CHAPTER 6

Ecological Effects of Hydrology on the Everglades Protection Area

Lingering Effects of the 2000-2001 Drought Have Not Been Found as Water Conditions Returned to Normal in the Everglades Protection Area

Last year it was predicted that the full impact of the 2000-2001 drought might not be felt until the 2002 water year. However, there has been no indication of any hydrologic lag effects or delayed impacts. On average, water depths this year were greater than average, despite the fact that most District-managed inflows were below average. Though inflows to the Water Conservation Areas do not yet follow a rainfall-driven schedule, recession rates were generally consistent with estimates of historical averages. Everglades water levels were generally erratic, particularly in Water Conservation Area 2A, demonstrating that Everglades waterbodies continue to be hydrologically fragmented. No direct ecological impacts of the above-average water depths or erratic water depth patterns have yet been observed.

Restoration and management of estuarine systems are linked to hydrologic trends. For example, salinity conditions in Florida Bay were near the average observed since 1991 and were related to rainfall patterns and freshwater flow through the southeast Everglades. Ecological restoration of the bay, as it is being considered in the Comprehensive Everglades Restoration Plan (CERP), is likely to entail increased freshwater flow to restore salinity patterns. However, a recent review by the Committee on Restoration of the Greater Everglades Ecosystem (CROGEE) cautioned that increased freshwater flow to Florida Bay might not be beneficial because it might also increase nitrogen loading and stimulate algal blooms in the bay. The committee recommended increased research on nitrogen and more attention to these possibilities in restoration planning.



Everglades Crayfish Might Provide a Useful Measure of Hydrological Conditions in Wetlands

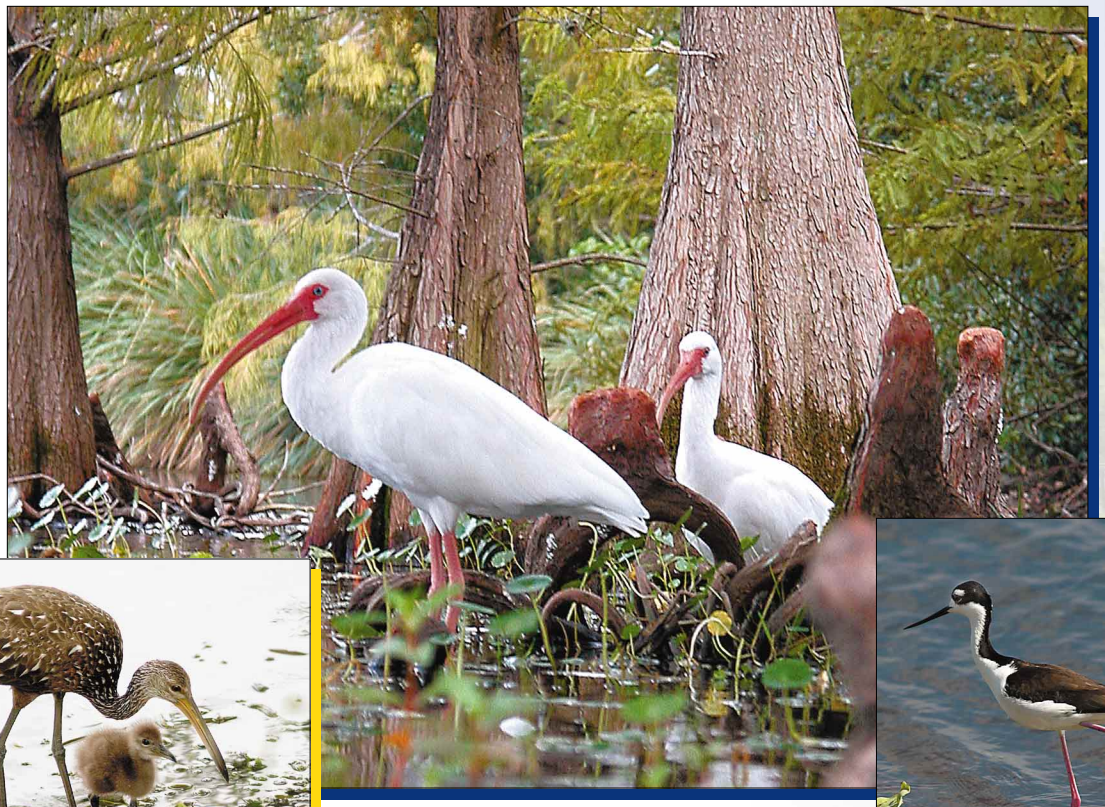
The District initiated a long-term study on the Everglades crayfish in isolated wetlands to evaluate how drydowns might harm this vital prey animal. Isolated wetlands are closely tied to groundwater fluctuations and are vulnerable to ecological impacts from consumptive water uses. Understanding how hydrology drives wetland biota is critical to decision-making processes for compliance with state wetland protection regulations. Maximum burrow depths by the Everglades crayfish at the end of the dry season were found to be correlated with groundwater elevation. This finding could point to a survival threshold that could be used to set Everglades restoration targets and minimum flows and levels.

For the Third Straight Year, Wading Bird Nesting in South Florida Was Highly Successful

Data on wading birds are critical to long-term restoration goals and short-term water management decisions. Many university and state agencies assist the District in collecting and evaluating wading bird information. The estimated number of wading bird nests in South Florida in 2002 (excluding cattle egrets, which are not dependent on wetlands) was 68,504. This is an 82-percent increase from last year and a 73-percent increase from 2000 (excluding Florida Bay) – two of the best years in a decade. This banner nesting was attributed to increased nesting by white ibises, wood storks and snowy egrets, the three species that have declined the most since the 1930s. Much of the increased nesting effort was associated with a large colony in northern WCA-3 that contained 35,000 nests – one of the largest wading bird colonies seen in recent years. The distribution and numbers of nests illustrate the close connection between wading birds and dynamic hydrologic patterns characteristic of the Everglades.

Ecological Research Will Allow Prediction of Everglades Landscape Dynamics to Guide Implementation of the Comprehensive Everglades Restoration Plan

Research on tree island and mangrove dynamics will help establish long-term restoration goals and short-term operational guidelines for the Everglades. Tree island researchers are evaluating patterns of tree growth and biodiversity relative to hydrology to provide performance measurements for the CERP. Findings to date include the fact that trees on islands with relatively short hydroperiods (one to two months of dry conditions) grow better than trees on islands with long hydroperiods (one to two weeks of dry conditions).



White ibises (Eudocimus albus) foraging

Limpkin (Aramus guarana) with fledgling

Black-necked stilt (Himantopus mexicanus) wading

To support Everglades restoration, the District has added the flooding tolerance and physiological requirements of Everglades ridge and slough habitats to its research portfolio. There is a need to know how to prevent further encroachment of sawgrass and cattail into slough habitats, how to restore subtle topographic features, and how to evaluate the need for canal backfilling. Vegetation studies have found that Spikerush, a slough species, fared better under flooded conditions, while Beak Rush, a wet-prairie species, tended to develop better under drained conditions. In addition, hydrologic changes have been found to have long-lasting impacts on soils. For example, soil decomposition was found to occur faster under enriched conditions, and open-water habitats exhibited faster decomposition than sawgrass ridge habitats. These results appear to support a decomposition-mediated formation of sloughs and sawgrass ridges over time and contribute to the debate on the role of sheetflow in structuring the landscape.

Tailored Simulation Models Are Being Applied to the Complex Information Needs of the Comprehensive Everglades Restoration Plan

The Regional Simulation Model has been developed as the next-generation South Florida Water Management Model. An application is currently being developed to simulate the hydrology of the southern Everglades. This application will help predict the influence of flooding on Cape Sable seaside sparrow habitats, investigate the impact of compartmentalization on the southern Everglades and study the effect of freshwater discharges on Florida Bay salinity. Another dynamic simulation model has been developed to predict the response of submersed plants in Florida Bay to changes in hydrology, eutrophication and water quality. Modeling suggested that, individually, neither an increase in salinity nor an increase in nutrients produced much of a response in seagrass. However, together these stresses are predicted to produce a strong reduction in initial spring growth rate and the amount of seagrass tissue in summer.

CHAPTER 7A

Comprehensive Everglades Restoration Plan

Update on CERP Implementation

The Comprehensive Everglades Restoration Plan (CERP) is the framework and guide for the restoration, protection and preservation of the South Florida ecosystem. The CERP also provides for other water-related needs of the region, such as water supply and flood protection. The plan was authorized by Section 601 of the Water Resources Development Act of 2000 (WRDA 2000) (Public Law 106-541), which requires that the CERP be integrated with existing federal and state activities in accordance with Section 528 of the WRDA 1996 (Public Law 104-303).

The CERP Includes Over 50 Complex Projects to Restore Water Quality, Quantity, Timing and Distribution in South Florida

The goals of the CERP are to restore the quantity, quality, timing and distribution of water to the Everglades ecosystem. The CERP includes over 50 projects that involve either structural or operational changes to modify the Central and Southern Florida Project to achieve these goals. Due to regional scale and complexity, the effects of CERP implementation on ecosystem restoration will not be apparent for many years. Many projects must be implemented before the hydrologic improvements necessary for ecosystem restoration can begin. The timing and distribution of water in the region can be altered only after water storage capacity has been increased, along with any necessary water quality improvements. As each of the components to improve the timing and distribution of water are completed, the ecosystem should begin its long-term recovery.

At this stage of CERP implementation, the District and the United States Army Corps of Engineers are acquiring land, developing and administering programs, conducting pilot projects and feasibility studies, and developing project management plans and implementation reports. Several critical projects begun prior to the authorization of the CERP have been incorporated into the plan, and some are currently under construction.

Land Acquisition Is Essential for Many CERP Projects, and Over 18,000 Acres of Land Was Purchased During Water Year 2002 in Support of CERP

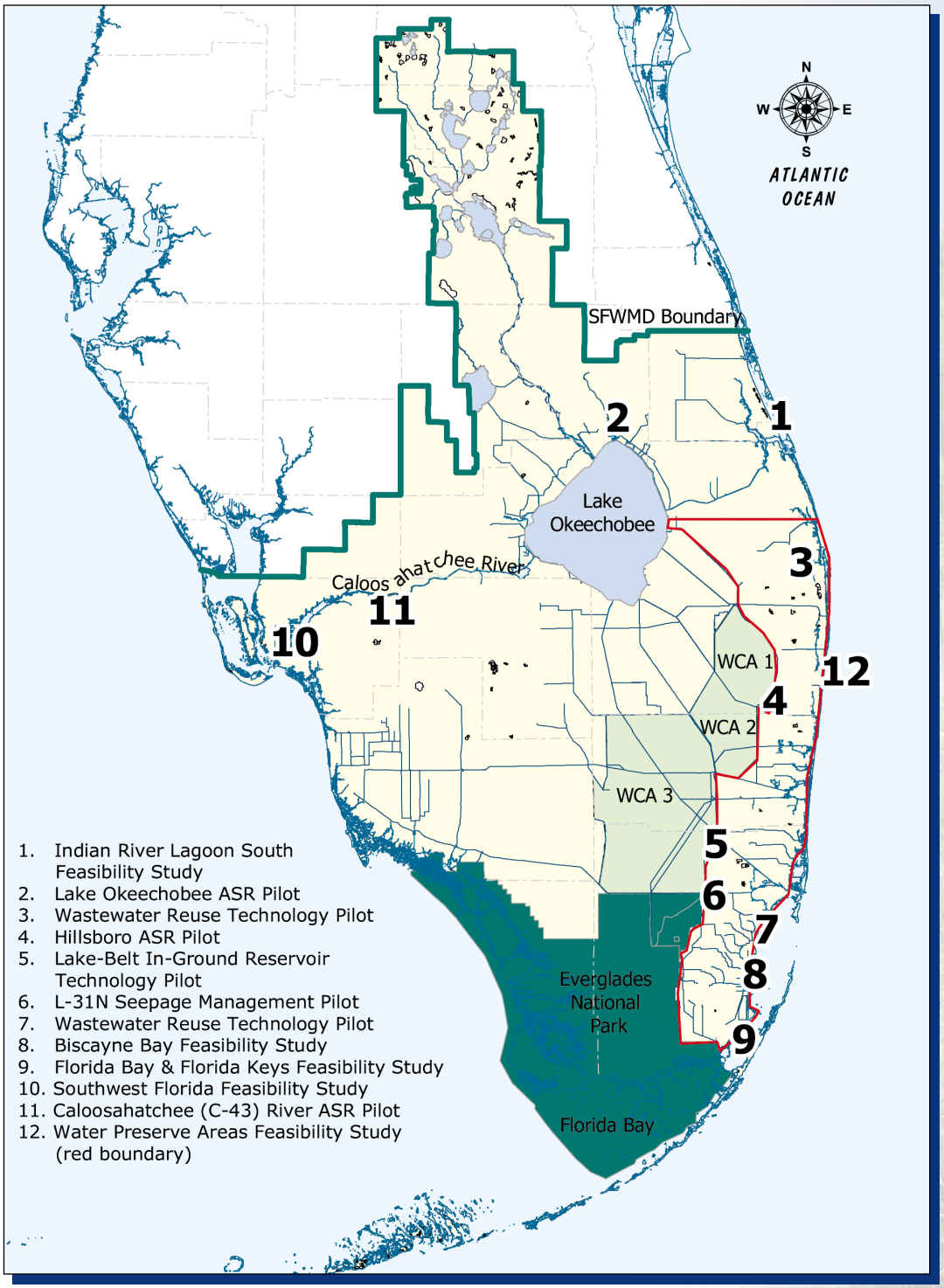
From May 1, 2001 through April 30, 2002 (Water Year 2002), 18,767 acres of land were acquired that are suitable for use by CERP projects. Some of this land will be used for the following projects: Biscayne Bay Coastal Wetlands, the C-111 Spreader canal, Broward County Water Preserve Area (WPA), Taylor Creek/Nubbin Slough Storage and Treatment Area, and Indian River Lagoon-South.

Seven major efforts currently comprise the program-level activities for the CERP. The activities include program controls, geodetic vertical control surveys, restoration coordination and verification, public outreach, environmental and economic equity, data management and recreation. During the past two years, program management plans were developed for all the programs, with the exception of the Master Recreation Plan, which is currently being developed. Also, the Master Program Management Plan and the Restoration Coordination and Verification (RECOVER) Program Management Plan are currently being updated.

The Programmatic Regulations Being Promulgated by the Federal Government Will Provide a Framework for CERP Implementation

The District and the United States Army Corps of Engineers have started detailed planning and design of CERP projects in accordance with the implementation schedule of the original plan. The implementation schedule is revised at least annually to incorporate changes based on new state and federal legislation and other factors. Also, changes are made to reduce technical uncertainties and clarify relationships between external milestones and specific CERP projects. The most recent schedule was published in July 2001 and will be revised following the promulgation of programmatic regulations required by WRDA 2000. The programmatic regulations will provide the blueprint by which the CERP will be implemented.

CERP Feasibility Studies and Pilot Projects



Several of these projects are pilot projects or feasibility studies and are illustrated above. The purpose of the pilot projects is to resolve technical uncertainties related to the use of various technologies to accomplish the systems modifications necessary to restore the South Florida ecosystem. The feasibility studies are designed to determine the need for additional projects to accomplish restoration goals that have been established for a particular region. Detailed planning and design have begun for seven pilot projects, three feasibility studies and 12 construction projects. In addition, implementation has continued for three feasibility studies and seven critical projects that commenced prior to the authorization of the CERP.

CHAPTER

7B RECOVER Activities

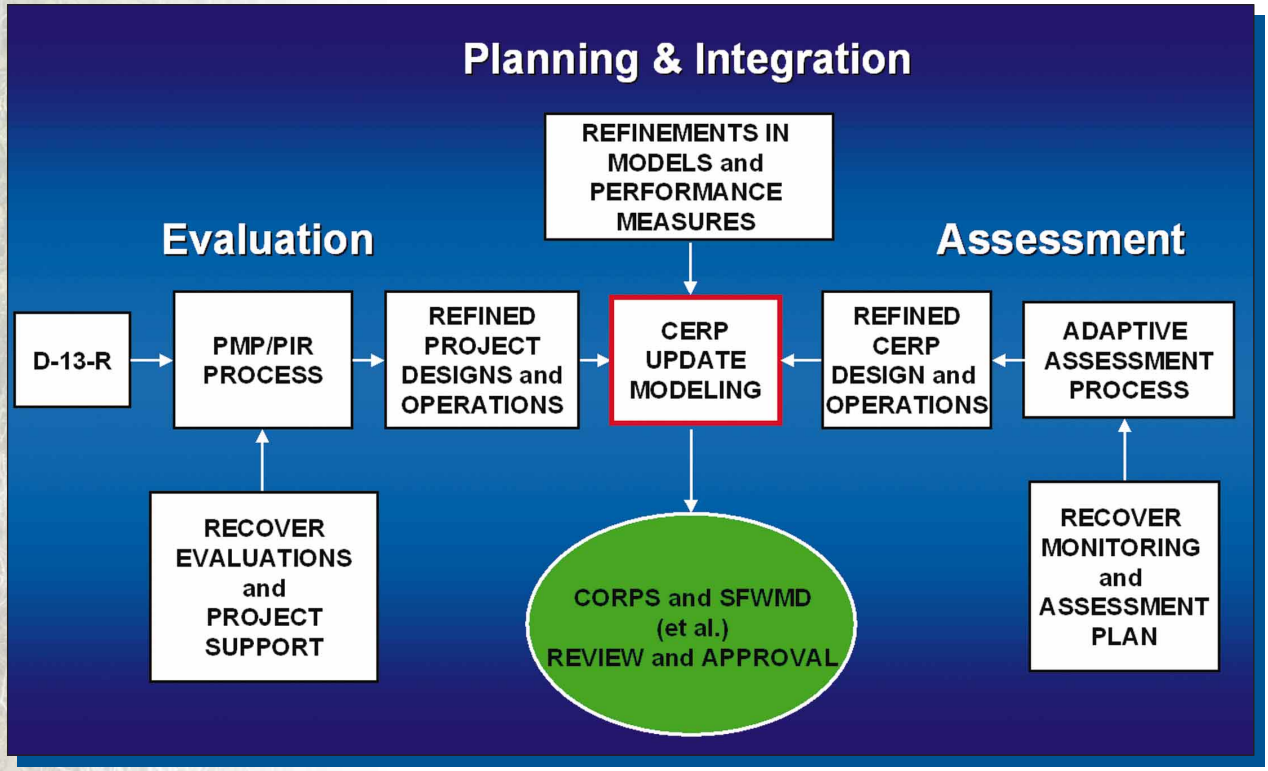
RECOVER, an Interagency Team, Will Bring Technical Information into CERP Implementation to Support Adaptive Management and Track Performance

RECOVER is an interagency, interdisciplinary team sponsored by the United States Army Corps of Engineers and the District. The role of RECOVER is to organize and apply scientific and technical information to support the system-wide goals and purposes of the Comprehensive Everglades Restoration Plan (CERP). RECOVER applies science and the tools of science to the three broad mission areas of system-wide evaluation, assessment, and planning. These linkages provide RECOVER with the scientific basis for meeting its overall objectives of evaluating and assessing CERP performance, refining and improving the CERP during the implementation period, and ensuring that a system-wide perspective is maintained throughout the restoration program.

RECOVER is developing an adaptive management program for the CERP that will measure how well its desired goals are achieved. It will also provide a feedback mechanism for assessing whether the responses by the systems that are being restored match expectations. These assessments will be used to determine when and how the programs could be improved in cases where expectations are not being met. The ultimate role of adaptive management in CERP is to have an ongoing, scientifically based process for substantially increasing the probability that the plan will succeed.

Regional Modeling Evaluations Continue to Be a Major RECOVER Activity

RECOVER continues the technical evaluation process at the regional level that began during the development of the CERP. RECOVER continues to develop and refine integrative models, such as the South Florida Water Management Model and the Natural System Model. Also, the Everglades Landscape Model is being reviewed with regard to evaluating water quality in the greater Everglades region. A total system conceptual ecological model is being developed to evaluate the interactions among the regional conceptual models and the upstream and downstream effects of what happens across boundaries.



The relationship between the three missions of RECOVER and CERP implementation

Several projects currently being undertaken by RECOVER will allow tracking of the CERP's performance. Development of a CERP Monitoring and Assessment Plan (MAP) has continued, and the public review draft will be made available in early 2003. The MAP establishes the framework for measuring system-wide responses and for assessing how well the CERP is meeting its goals and objectives. As part of this process, monitoring and assessment performance measures and a process for establishing interim goals have been developed.

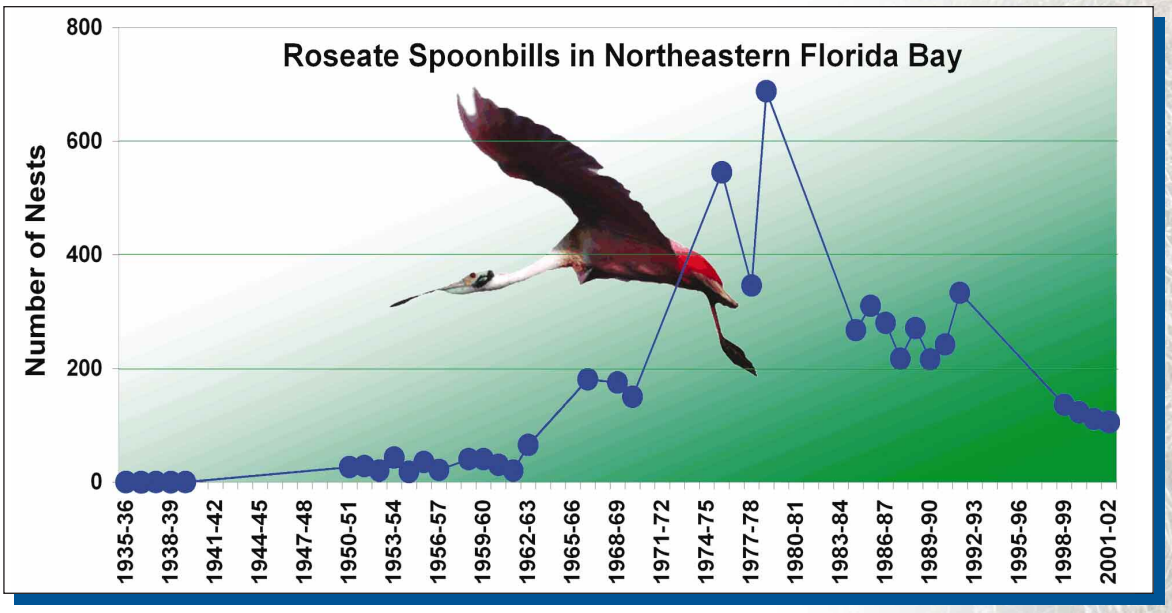
To provide the public and state legislators with an indication of the CERP's performance, a CERP Annual Report Card is being developed. The report card will use a set of key indicators that are representative of environmental health for both natural and human systems. Examples of key indicators are Roseate Spoonbill nesting patterns and water supply for South Florida. The initial report will cover baseline, or pre-CERP, conditions. Successive report cards are intended to provide an indication of improvements or other changes brought about by the implementation of the CERP. A major reason for issuing a report card so early in the implementation of CERP is to assure the public that there will be regular reporting on progress made towards meeting CERP goals. More in-depth reporting on CERP's effects will be carried out through the adaptive management program and periodic performance assessment reports.

The Initial CERP Update is currently under way to incorporate information on environmental changes and new information gained since the release of the CERP feasibility report in 1999. There are three efforts that are linked to the Initial CERP Update: (1) Incremental modeling of the CERP Master Implementation Schedule, (2) ASR Contingency Planning, and (3) Development of the pre-CERP baseline. The implementation schedule has been modified from that contained within the 1999 feasibility report (USACE and SFWMD, 1999), and there is a desire to understand what these changes mean hydrologically. It is envisioned that the modeling effort will analyze the currently scheduled sequence of construction projects at Five-year increments. This modeling will support the development of Interim Goals for restoration and Benchmarks for other water-related needs of the region, as called for in the draft Programmatic Regulations.

The second effort, ASR Contingency Planning, will entail the formulation and evaluation of two planning scenarios. One scenario will be to remove 100 percent of the ASR in the CERP from the plan; the second will be to remove 50 percent. Plan formulation for both scenarios will be to add features back into the plan in an attempt to realize the same level of performance as in the original Comprehensive Plan.

The third effort, development of a pre-CERP baseline, is necessary to establish the amount of water delivered by the Central and Southern Florida Project, which is of central importance to ensure attainment of the plan's benefits. All three activities will use the Initial CERP Update as the baseline from which planning will begin.

This update will result in a clearer picture of performance under revised planning conditions. Moreover, this information will be provided to the individual CERP project delivery teams as they begin project-level formulation and evaluation.



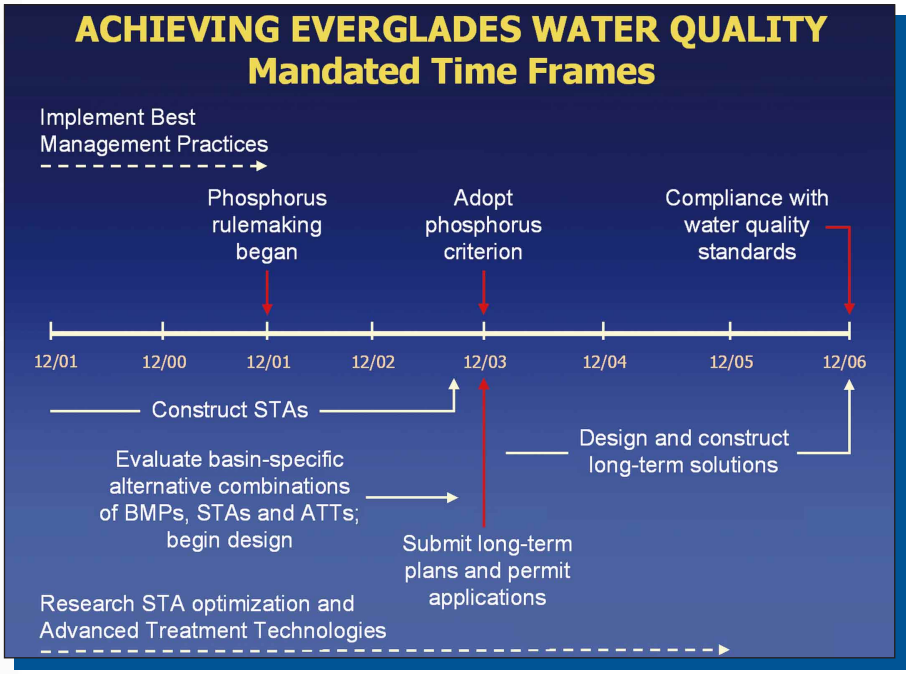
CHAPTER 8A

Other Everglades Programs
Achieving Long-Term Water Quality Goals

Everglades Forever Act Programs Continue to Progress Toward Achieving Water Quality Goals

The South Florida Water Management District, the Florida Department of Environmental Protection and other parties are aggressively pursuing interim and long-term Everglades water quality goals. Interim measures to reduce phosphorus levels include the Everglades Regulatory Program, a landowner-based application of agricultural Best Management Practices in the Everglades Agricultural Area, and the construction and operation of Stormwater Treatment Areas (STAs) to treat stormwater before it enters the Everglades Protection Area (EPA).

These phosphorus control programs have proven very effective at reducing the amount of phosphorus entering the Everglades. As of this date, the Everglades Regulatory Program and downstream Stormwater Treatment Areas have removed more than 1,400 metric tons of phosphorus that otherwise would have entered the Everglades. Best Management Practices have exceeded their 25-percent load reduction target by yielding more than a 50-percent reduction in phosphorus loading from the Everglades Agricultural Area. Average phosphorus concentrations in outflows from the Stormwater Treatment Areas have been less than 35 parts per billion (ppb), well below their 50-ppb target.



Challenges to Achieving Water Quality Goals Remain as the 2006 Everglades Forever Act Deadline Approaches

The long-term water quality goal established by the Everglades Forever Act requires that water delivered to the Everglades Protection Area meet state water quality standards by December 31, 2006. As shown in the above illustration, meeting this ambitious goal involves a sequence of complex activities to select and implement phosphorus control measures for all inflows to the Everglades Protection Area. Investigations of how to improve STA performance, and exploration of new technologies, aided by research costing in excess of $35 million, has resulted in significant advances toward achieving this long-term goal. Even so, the effort to maintain water quality is an inexact science, particularly as it pertains to the extremely low levels of phosphorus associated with Everglades Forever Act mandates. Establishing a phosphorus criterion with a measurement methodology is an important step towards the goal, as is the appropriation of funding for implementation of basin-specific phosphorus controls. Continuation of Stormwater Treatment Area optimization research is needed to ensure the long-term goal is achieved.

The District is making a concerted effort to integrate and expedite research, planning, construction and other activities designed to achieve this long-term water quality goal and to synchronize these activities with the Comprehensive Everglades Restoration Plan.

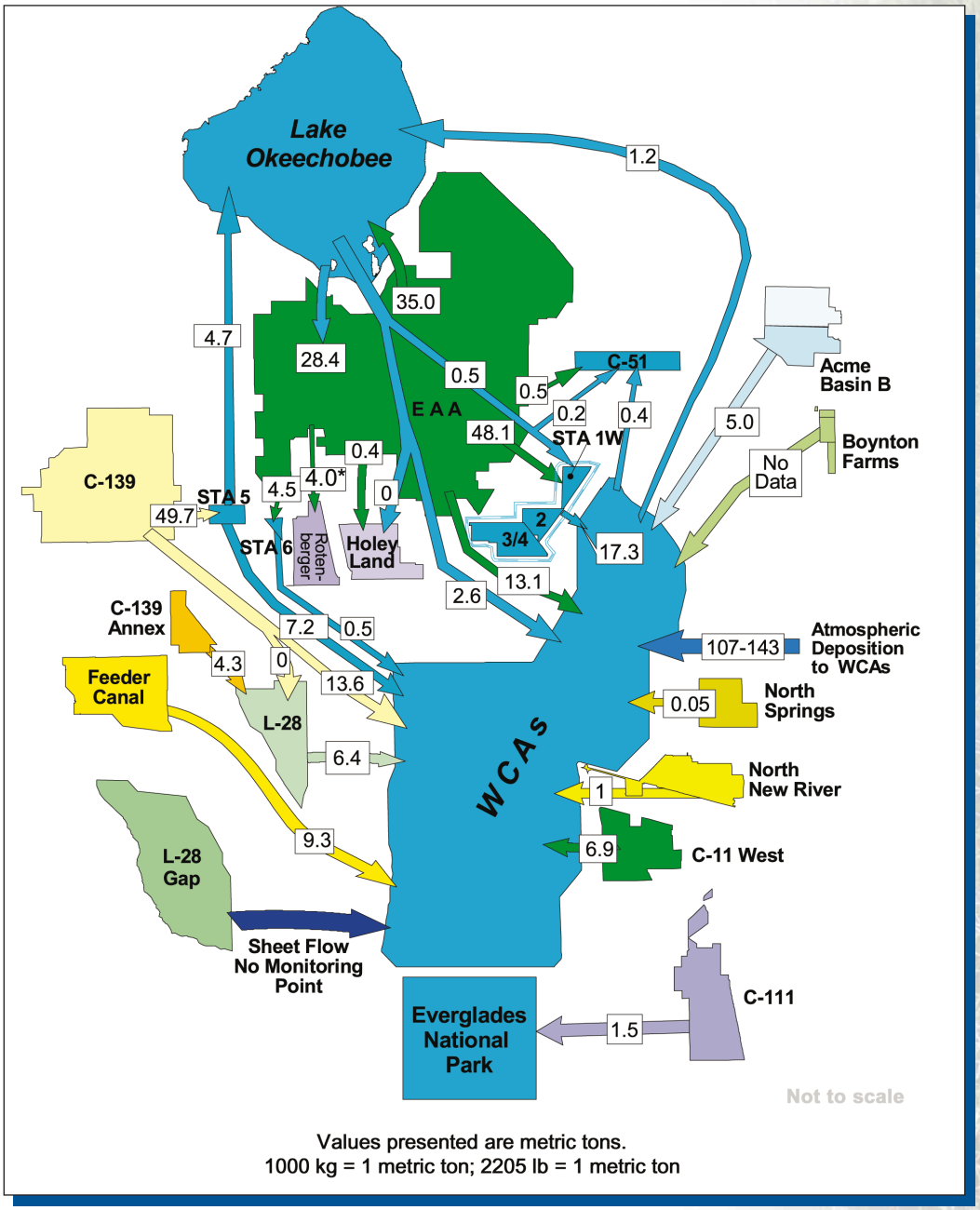
Basin-specific Feasibility Studies are progressing on schedule and provide a good example of planning and integration necessary to control phosphorus loading to the Everglades. These detailed studies of 13 EPA tributary basins include developing baseline data sets on flow and water quality, evaluating combinations of control measures and assessing alternative solutions for each basin. These activities are being conducted in

concert with stakeholders and ongoing communication via the Internet and public meetings.

The Everglades Protection Area Receives Phosphorus Loading from Multiple Sources

The figure below provides information on the pathways of phosphorus to the Everglades Protection Area for Water Year 2002. In addition to substantial atmospheric inputs, phosphorus is conveyed through surface water inflows regulated by water control structures. These inflows are from agricultural areas to the north and west, from Lake Okeechobee to the north and from predominantly urbanized areas to the east. Surface water inflows and loads vary from year to year in response to water management operational decisions and hydrological conditions. The depiction of phosphorus loading, below, communicates both the magnitude and the diversity of pathways, and illustrates the importance of controlling phosphorus loads from the various sources.

Phosphorus Loads Conveyed into the Everglades Protection Area



CHAPTER

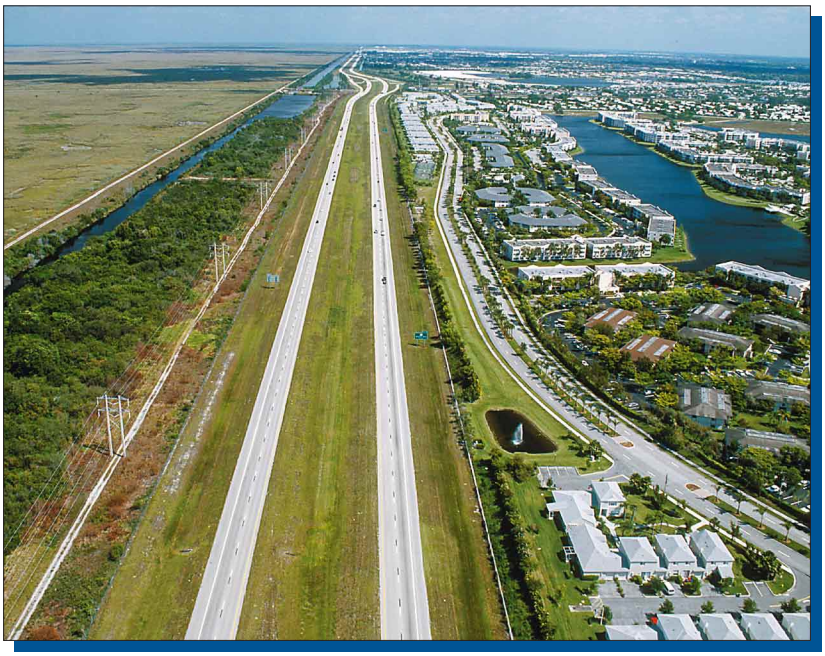
8B The Everglades Stormwater Program

Intensive Data Analysis and Planning Is Providing Information for Water Quality Improvements in Eight Everglades Basins

The Everglades Stormwater Program (ESP) is charged with administering the non-Everglades Construction Project (non-ECP) permit for eight tributary basins outside the Everglades Construction Project. The location of these basins is illustrated by the map on the next page. Through its Regulatory Action Strategy, the program is also responsible for developing and implementing strategies for achieving compliance with state water quality standards at structures that discharge into the Everglades Protection Area from these eight basins. The District continues to foster communication with local governments, special districts, the Miccosukee and Seminole Indian tribes, and other state and federal agencies to achieve the goals of the Everglades Forever Act, the non-ECP permit, and a future long-term compliance permit.

The District has improved monitoring programs upstream of structures that discharge into the Everglades Protection Area to identify "hot spots," areas of water quality concern. The District's water quality monitoring program indicates that the quality of water discharging into the Everglades from these basins is generally acceptable, with the exception of phosphorus concentrations, dissolved oxygen, and pH and turbidity at a few sites. Analysis of phosphorus concentrations revealed substantial differences between basins, with the highest levels seen in ACME basin B and the lowest recorded from the C-111 basin. This evaluation indicates that although most basins have low to moderate phosphorus concentrations, concentrations greater than 10 ppb in at least six of the basins will have to be addressed through management activities.

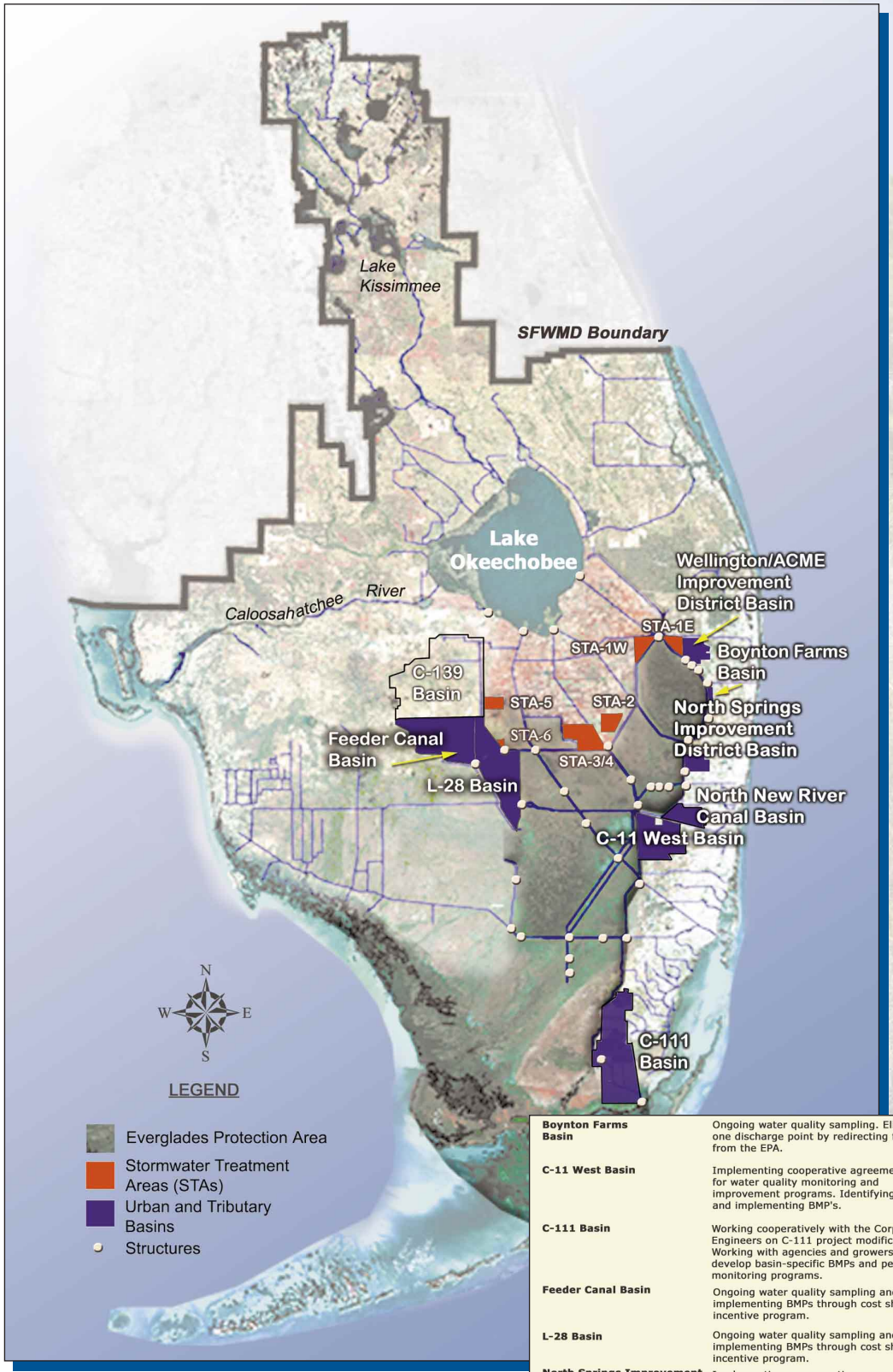
Through its 10-step Regulatory Action Strategy, the Everglades Stormwater Program is systematically developing water quality improvement strategies for the basins. The goal is to provide alternative combinations of management actions and guide an open process of alternative selection for eventual implementation. Although progress differs for each basin, most areas are nearing the completion of the 10-step strategy development. In addition, the District has executed a number of cooperative cost-share agreements with local governments to implement water quality improvement plans that consist of monitoring, Best Management Practices (BMPs) and operational modifications. Also, a BMP incentive program that will partially reimburse landowners who implement agreed-upon BMP plans has been implemented in the western basins. It is anticipated that this incentive program will be expanded.



The Everglades Stormwater Program will guide water quality improvement in diverse South Florida locations

Public outreach initiatives have expanded to include public education and development of educational tools, such as turfgrass and landscaping BMPs and an urban BMP document for South Florida. A feasibility study has been initiated in conjunction with the Everglades Construction Project to evaluate alternative combinations of private and public works, including integration with the Comprehensive Everglades Restoration Plan (CERP) to achieve compliance with the long-term water quality standards for the Everglades Protection Area.

Everglades Stormwater Program Locations



Boynton Farms Basin	Ongoing water quality sampling. Eliminated one discharge point by redirecting flow away from the EPA.
C-11 West Basin	Implementing cooperative agreements for water quality monitoring and improvement programs. Identifying "hotspots" and implementing BMP's.
C-111 Basin	Working cooperatively with the Corps of Engineers on C-111 project modifications. Working with agencies and growers to develop basin-specific BMPs and pesticide monitoring programs.
Feeder Canal Basin	Ongoing water quality sampling and implementing BMPs through cost share incentive program.
L-28 Basin	Ongoing water quality sampling and implementing BMPs through cost share incentive program.
North Springs Improvement District Basin (NSID)	Implementing a cooperative agreement for water quality sampling and improvement programs. Identifying "hotspots" and implementing BMPs.
North New River Canal Basin	Implementing a cooperative agreement for water quality sampling and improvement programs. Identifying "hotspots" and implementing BMPs.
Wellington / ACME Improvement District Basin	Implementing a cooperative agreement for water quality sampling and improvement programs. Identifying "hotspots" and implementing BMPs. Working cooperatively on developnig a basin-wide solution.

CHAPTER 8C

Land Acquisition in Support of Projects in the Everglades Region

The District continues to aggressively acquire lands in support of water resources projects and programs throughout the region. The District's land acquisition strategy prioritizes the purchase of land based on construction schedules, willingness of landowners to sell, land threatened by potential development, and land in areas of rapidly escalating property values. From May 1, 2001 through April 30, 2002 (Water Year 2002), the District successfully acquired 21,254 acres of land to be used for reservoirs and Stormwater Treatment Areas and to improve the South Florida region's flood control system, drainage and water supply. Land acquisitions during WY02 are summarized and described by project or geographic region in the table below.

Lands totaling 2,144 acres were acquired for the East Coast Buffer, Water Preserve Areas. These lands are intended to serve as a buffer between natural and urban areas, collecting and storing excess water that would otherwise be discharged to tide.

The District, in partnership with Miami-Dade County, continued to acquire lands in the Southern Everglades region, coordinate acquisition activities and leverage both agencies' funding sources. Model Lands property will be used to maintain the saltwater barrier line, preventing further saltwater intrusion into the south Miami-Dade region. Biscayne Coastal Wetlands property will provide the opportunity for better distribution of fresh water to Biscayne Bay. During WY02, more than 738 acres were acquired in these two areas.

The majority of the lands acquired in WY02 will go toward addressing requirements of the Comprehensive Everglades Restoration Plan (CERP). Slightly more than 18,767 acres, or 88 percent of the lands acquired in WY02, are suitable for use by these projects.

By executing its acquisition strategy in WY02, the District is poised to complete the acquisitions necessary for several upcoming construction projects. The 4,785-acre acquisition of Grassy Island Ranch provides land within the Taylor Creek/Nubbin Slough Project area that is suitable for the creation of treatment marshes and onsite wetlands restoration. The acquisition of 13,186 acres of Allapattah Ranch within the Indian River Lagoon-South Project will provide alternative storage, rehydration, habitat restoration and water quality improvement.

The 18,767 acres acquired in WY02 increased the total lands available for use by CERP projects to 122,918 acres, representing 45 percent of the estimated land needed for the restoration. These purchases and the District's other WY02 land acquisition successes were accomplished only through coordination with local, state and federal agencies and in cooperation with the general public.

Closings May 1, 2001 through April 30, 2002

By Geographic Region	Purpose or Comments	Land Area-Acres
East Coast Buffer, Water Preserve Areas	Marshes, reservoirs and groundwater recharge areas that abut East Coast Protective Levee	2,144
Model Lands	Recharge area for maintenance of saltwater intrusion	701*
Stormwater Treatment Areas	Wetland treatment marshes that will naturally remove nutrients from stormwater runoff	374
Biscayne Coastal Wetlands	Mixture of red, black and white mangroves adjacent to other protected land, providing opportunity for better distribution of freshwater	37
8.5 Square Mile Area	East Everglades in low-lying area of Miami-Dade County	2.5
Allapattah Ranch	Improved pasture and degraded wetlands identified for use as alternative storage, rehydration, habitat restoration and water quality improvements	13,186
Taylor Creek, Nubbin Slough	Improved pasture with oak/cabbage palm hammocks; providing opportunity for treatment marshes and on-site wetlands restoration	4,785
Water Conservation Areas	Part of the original Central and Southern Florida Flood Control Project	1,100
Total Acquired WY02		21,254*
By Project	**Purpose or Comments**	**Acres**
Comprehensive Everglades Restoration Plan (CERP)	Acres (percent) of land acquired during WY02 suitable for use by CERP projects	18,767* (88%)
Non-CERP Acquisitions	Acres (percent) of land acquired during WY02 for Critical Restoration (CRP) and Save Our Rivers (SOR) projects	2,487 (12%)
Total Acquired WY02		21,254*

**Miami-Dade County acquired the 701 acres in the Model Lands Project, for an adjusted total acquired WY02 acreage of 21,955 acres, with 19,648 acres being suitable for use by CERP.*

CHAPTER

8D Managing Fiscal Resources

The District is required to provide detailed financial information on Everglades restoration. The 1997 Everglades Oversight Act requires the reporting of financial information for the Everglades Construction Project (ECP). The 1994 Everglades Forever Act (EFA) requires the District to annually provide a comparison of actual versus projected revenues and a projection of costs and revenues over the succeeding five-year period. The EFA directed the District to separately account for all monies used to fund the ECP. A comparison of actual versus projected revenues and a projection of costs and revenues over the succeeding five-year period are provided in the pie chart on the following page.

Construction of G-310 outflow pump station for STA-1W

A dedicated funding source is essential to conduct Everglades and Florida Bay protection and restoration programs. The Everglades Construction Project, a major element of the Everglades Program, is one of the largest public works projects in the nation for environmental restoration, estimated to cost approximately $867 million over 20 years. Florida Bay Restoration Program activities are ongoing, with a projected cost estimate of approximately $331 million. Portions of the program's activities are currently under review for cost-estimate revisions.

Funding Sources

The District has the authority to levy *ad valorem* taxes of up to 0.1 mill within the Okeechobee basin for land acquisition, design and construction of the Everglades Construction Project. For Fiscal Year 2002 (FY02), net *ad valorem* tax revenues were approximately $34.9 million (unaudited) through September 30, 2002. The other funding sources designated by the EFA include agricultural privilege taxes, state land funds, federal funds, excess revenues from Alligator Alley tolls, other environmental mitigation funds and any additional funds that become available for this purpose from any other source.

To fund the first phase of the Everglades Program, the Everglades Forever Act imposes an annual tax for the privilege of conducting an agricultural trade or business within the Everglades Agricultural Area (EAA) and C-139 basins. The agricultural privilege tax rate ranges from a minimum of $24.89 per acre from 1994 to 1997, to a potential maximum of $35 per acre from 2006 to 2013. Actual net EAA agricultural privilege taxes collected in FY02 were approximately $11.7 million (unaudited) through September 30, 2002. After 2013 the tax rate will decrease to $10 per acre to fund operations and maintenance of the Stormwater Treatment Areas. In FY02 the net C-139 basin agricultural privilege taxes collected were $617,505 (unaudited) through September 30, 2002.

CHAPTER

8D Managing Fiscal Resources (cont.)

The Everglades Forever Act includes the legislative finding that Alligator Alley, designated as State Highway 84 and U.S. Interstate Highway 75, contributed to the alteration of water flows in the Everglades and also affected the ecological patterns of the historic southern Everglades. The Florida Legislature determined that it is in the public interest to establish a system of tolls for Alligator Alley to raise money to help restore the natural values lost by the highway's construction. Toll revenues must be split equally between the Everglades and Florida Bay restoration projects. The Florida Department of Transportation and the District entered into a Memorandum of Understanding in 1997, setting out the basis for depositing the funds in the Everglades Trust Fund. Since the initial transfer in 1997, a total of $10,125,000 has been received from the Florida Department of Transportation during FY98 through FY02 (as of September 30, 2002), which was also split equally between both projects.

The Water Resources Development Act of 1996 provides cost-sharing funding for some programs related to Everglades restoration. STA 1-east/C-51 West is the only Everglades Forever Act (EFA) project component that is federally funded. The federal government is responsible for a major portion of the total estimated cost of $251.8 million, or approximately $231.7 million. The remaining $20.1 million represents the local share of the total estimated cost.

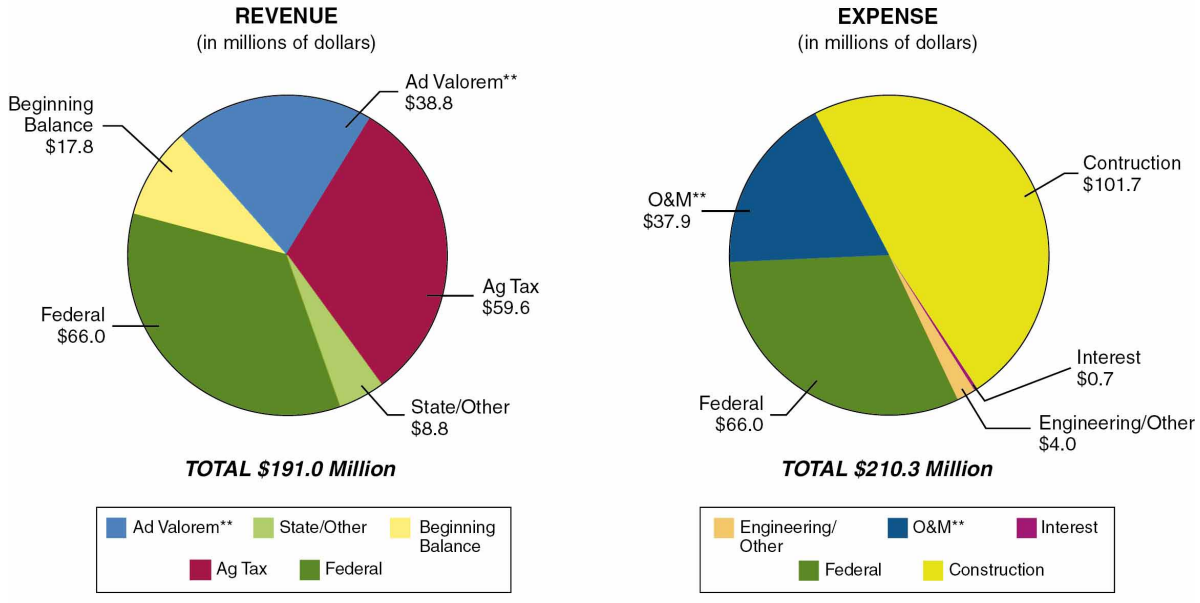
The Comprehensive Everglades Restoration Plan (CERP), formerly known as the C&SF Restudy, provides a framework and guide to restore, protect and preserve the water resources of central and southern Florida, including the Everglades. Funding for CERP will be shared equally between the federal government and local and state agencies (for more information, visit the District's CERP Website at http://www.evergladesplan.org).

Unfunded EFA Mandates

The Everglades Forever Act requires other significant mandates through 2014. These mandates, which are currently unfunded, include research, regulatory program development and implementation, exotic species control and other activities. Since the EFA did not designate funding sources beyond the Everglades Construction Project, the District will rely almost exclusively on *ad valorem* funds to cover these mandates.

Everglades Construction Project
Five-Year Project Estimates

October 1, 2002 to September 30, 2007



***Excludes operating millage and expense for non-STA O&M.*
Projected revenues are net collection costs.

CHAPTER

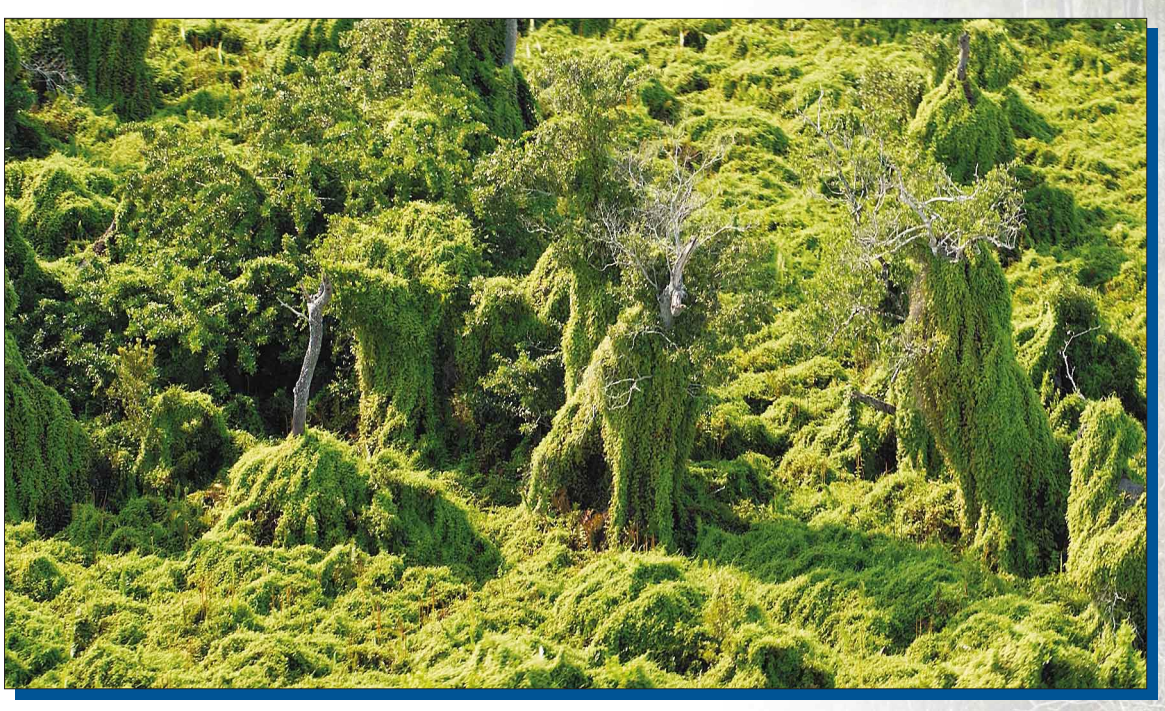
8E Comprehensive Review of Exotic Species in the Everglades Protection Area

Invasion by Exotic Plants and Animals Is a Growing Threat to Natural Systems in South Florida and Around the Globe

Ecological impacts of invasive exotic species have become an extremely serious environmental problem for the Everglades Protection Area (EPA) and many other areas around the world. In 1993 the U.S. Congress Office of Technology Assessment reported that of the 630 listed, threatened and endangered (plant and animal) species in the United States, 213 are primarily or exclusively listed due to losses caused by invasive exotic plants. In Florida, all information to date clearly demonstrates that non-native, invasive plants and animals have taken an aggressive hold in valued ecosystems and are continuing to spread at an alarming rate. Currently, more than 31 percent of plant species and 26 percent of animal species found in Florida are non-native and are having pervasive impacts in many important environments throughout the state. The Everglades Forever Act of 1994 calls for the District to coordinate and monitor invasive species programs in the Everglades Protection Area. The District has a well-established program to deal with exotic invasive plants, but does not currently have dedicated staff or funding to investigate or control exotic invasive animals within the Everglades Protection Area.

The importance of exotic species to environmental management in South Florida is demonstrated by the great number of plans, reports, statements and papers that have been written on the subject. Various committees from governmental agencies, universities, state and federal task forces and other organizations have expressed grave concerns over the far-reaching consequences of invasive species, and have emphasized that control and management of non-indigenous species must be a critical component of ecosystem restoration in South Florida.

The urgency of this environmental problem can be seen in the actions of the South Florida Ecosystem Restoration Task Force. In 1997 the Task Force established the Noxious and Exotic Weeds Task Team to focus on non-indigenous plants, and in 1998 it organized an *ad hoc*



Old World climbing fern (Lygodium microphylium) infestation of a tree island in Water Conservation Area 1

CHAPTER 8E

Comprehensive Review of Exotic Species in the Everglades Protection Area (cont.)

interagency team to focus on South Florida's non-indigenous animals. In 2000, the task team completed a report titled, "Weeds Won't Wait: Assessment and Strategic Plan for Management of Invasive Exotic Plant Species." The task team is now working on developing an implementation plan and cross-cutting budget to coordinate agency actions outlined in the strategic plan. Unfortunately, the problem of how to manage non-indigenous animals is still in the assessment phase. However, a report on exotic animals was published in 2000 by the National Oceanographic and Atmospheric Administration. This publication, "Initial Survey of Non-Indigenous Animals in South Florida," evaluated the status of these animals in all habitats, described limited control efforts, and identified agency needs and conflicts.

To be successful in stemming the tide of invasions by non-indigenous plants and animals, all agencies involved in ecosystem management in South Florida must make a commitment to support research with staff and finances. Additional information is urgently needed on the identification and distribution of non-indigenous species, potential biological controls, integrated pest management and the effects of water level fluctuations on the spread of invasive species. At the same time, agencies must also continue to fund ongoing invasive species management, promote statewide agency coordination, develop comprehensive management authorities and regulations, and develop public/private partnerships.

Successful Control of Some Exotic Plants Shows What Is Possible; More Widespread Success Will Require Integrated Research and Control Programs by Agencies Throughout South Florida

Many different techniques are used to control exotic invasive plants within the Everglades Protection Area. Biological agents, herbicides, manual and mechanical controls, and management practices, such as prescribed burning and water level manipulation, are used separately or in combination to slow the spread of exotics. While each of the different methods have their strengths and weaknesses, biological control may offer the most cost-effective, long-term management approach for control of widespread invasive weeds. However, no one method is the final answer, and control techniques to deal with exotic invasive plants need to be better integrated. A new program to be conducted jointly by the District and the U.S. Department of Agriculture is a step in the right direction. This five-year, collaborative program, called The Areawide Management and Evaluation (TAME) Melaleuca program, will demonstrate integrated melaleuca management on public and private lands. It is hoped that this project will serve as a model for other species-based management plans.

Lobate lac scale insects (Paratachardina lobata lobata) on tree branch (Inset: close-up view of immature scale)

The task of controlling non-indigenous species - both animal and plant - cannot be dealt with by a single method, discipline or agency. Reducing the impacts of invasive species cannot be the responsibility of just one regulatory agency, and controlling the invasions in nature cannot be delegated to just one land management agency. The attack on invasive, exotic species in South Florida must be done through a governmental alliance. For the District, control of exotic species is a necessary component of all aspects of water resource management, be it for flood control, water supply, water quality or natural systems.

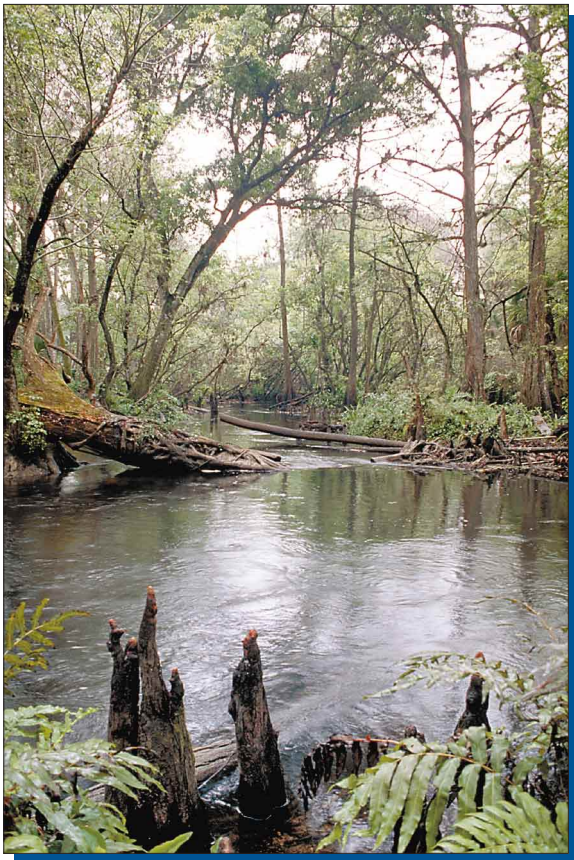
CHAPTER

8F

The Lower East Coast Regional Water Supply Plan

The Lower East Coast Plan Is Guiding Diverse Projects to Sustain Water Supplies Under the Increasing Demands of Humans and the Environment

The Lower East Coast Regional Water Supply Plan (LEC Plan) provides a blueprint to help meet South Florida's water resource needs through 2020. Development of the plan began in 1992, when the District, under the authority of state law, initiated an eight-year study of the region's future water needs. The District Governing Board adopted the LEC Regional Water Supply Plan in May 2000.



Northwest fork of the Loxahatchee River, part of the LEC Plan

The area's future demands for both potable and irrigation water and water supply to the environment are all projected to greatly increase by 2020. To help meet these needs, recommendations from the LEC Plan were implemented during 2002, including developing additional water resource and water supply projects, completing related studies, and developing rules for minimum flows and levels and consumptive use permitting.

Reservations of Water for Supplying Natural Systems Under the Comprehensive Everglades Restoration Plan Will Be Made by the District, Using Its Rule-making Authority

Reservations of water for the natural systems will be made by the District under state law while being consistent with the federal Water Resources Development Act (2000), which requires quantification and protection of water for the environment. In early 2002, the interagency Water Reservations Evaluation Team began the process of identifying and protecting water made available through Everglades restoration. During 2002, major policy, technical and process issues have been addressed through interagency and public meetings. In addition, the team developed a draft white paper on important concepts and made it available for public review. This paper outlines the process for protecting water made available through the Comprehensive Everglades Restoration Plan and is slated for revision and completion by early 2003.

Expansion of the Pompano Beach reclaimed water system was completed in 2002

Acknowledgments

The South Florida Water Management District and the Florida Department of Environmental Protection wish to gratefully acknowledge the contributions of the many professionals who have made the *2003 Everglades Consolidated Report* a reality.

Authors: This Report could not exist without the diligent effort of its many authors. Their excellent analyses of complex information form the substance of this Report and its quality and value are a reflection of their competence, commitment and willingness to respond fully to peer review and public comment. The professionalism and dedication of these individuals are gratefully acknowledged. Names of all the authors who contributed to the Report can be found at the beginning of each chapter of the main *2003 Everglades Consolidated Report*, which can be accessed on the CD included on the inside back cover of this Executive Summary.

Editorial and production team: The *2003 Everglades Consolidated Report* was organized, edited and formatted by an editorial and production team of dedicated professionals. The exceptional teamwork and productivity of these individuals are respectfully acknowledged: Diane Bello-Smith, Ken Chen, Cheri Craft, Myra Gregory, Penny Holm, Christopher King, Trudy Morris, Susana Pascal and Carrie L. Trutwin, Report production manager.

Other contributors: In recognition that many individuals support the diverse activities necessary to complete the Report and conduct its intensive peer review, both agencies also recognize individuals from the District's Environmental Monitoring and Assessment (EMA) Department, who provided essential data analyses and technical assessments for multiple chapters and appendices in the Report: Tim Bechtel, Larry Fink, Guy Germain, Steven Hill, Nenad Iricanin, Cheol Mo, Richard Pheuffer and Darren Rumbold. In addition, the following individuals from the District's EMA department are acknowledged for their vital assistance in conducting the peer review and public workshops: Andrea Carlton, Linda Davis, Barbara Dickey, Trudy Morris and Mary Skinner.

The District's Garth Redfield, Report editor, manages the Report development process in association with co-editors Gary Goforth and Kirk Burns. These editors work closely with Frank Nearhoof of the Department's Water Quality Standards and Special Projects Program to coordinate the creation of this joint product. This large, multidisciplinary Report could not be produced without the thoughtful oversight of senior management. In particular, the effective leadership of Naomi Duerr, Debra Azeredo, Linda Lindstrom, Jan Loftin and Emilio Vazquez from the District, and Jerry Brooks from the Department are gratefully acknowledged.

Glossary

Advanced Treatment Technologies (ATTs) - Biological and chemical treatment technologies designed to reduce phosphorus concentrations in stormwater.

Best Management Practices (BMPs) - Land, industrial and waste management techniques that reduce pollutant loading from an industry or land use.

Bioaccumulation - A great increase in concentration of certain chemicals (such as pesticides and metals) by organisms over that to which they are exposed in their environment.

Excursion of a water quality constituent – A constituent concentration that is of potential concern as an apparent exceedance of an applicable water quality criterion.

Exotic Species – Species of plants or animals that are not naturally found in a region (non-indigenous) and can sometimes aggressively invade habitats and cause multiple ecological changes, including the displacement of native species.

Flow-Weighted Mean Concentration - The average concentration of a substance in water, corrected for the volume of water flow at the time of sampling. Samples taken when flow is high are given greater weight in the average, and flow-weighted concentrations can be used to calculate mass loading at a particular location.

Geometric Mean - An average calculated from data transformed using powers or logarithms and then transformed back to original scale. The geometric mean (geomean) is similar to the median in that it is insensitive to extreme values and is helpful in representing the average of highly variable data, such as water quality data.

Loading (Mass Loading) - The mass of a material entering an area per unit time (e.g., phosphorus loading into Water Conservation Area 2A as metric tons per year).

Median – The middle value in a set of ordered data.

Methylmercury – The very toxic form of the heavy metal mercury that is readily accumulated by living organisms.

Parts Per Billion (ppb) – A concentration equivalent to one microgram per liter.

Periphyton – A community of algae, tiny animals and microbes attached to surfaces in aquatic environments.

Stormwater Treatment Area (STA) – A large, constructed wetland designed to remove pollutants from stormwater runoff.

Phosphorus (P) – An element that is essential to life and often promotes the growth of plants in water.

Water Quality Criteria - Constituent concentrations based on scientific data and judgements on the relationship between pollutant concentrations and environmental and human health effects.

Water Quality Standard – State water quality standards are composed of the beneficial use classification, numerical criteria applicable to that classification, the Florida anti-degradation policy and several provisions in other rules.

Water Year 2002 - The period from May 1, 2001 through April 30, 2002 during which water samples were collected to provide data for the *2003 Everglades Consolidated Report*.

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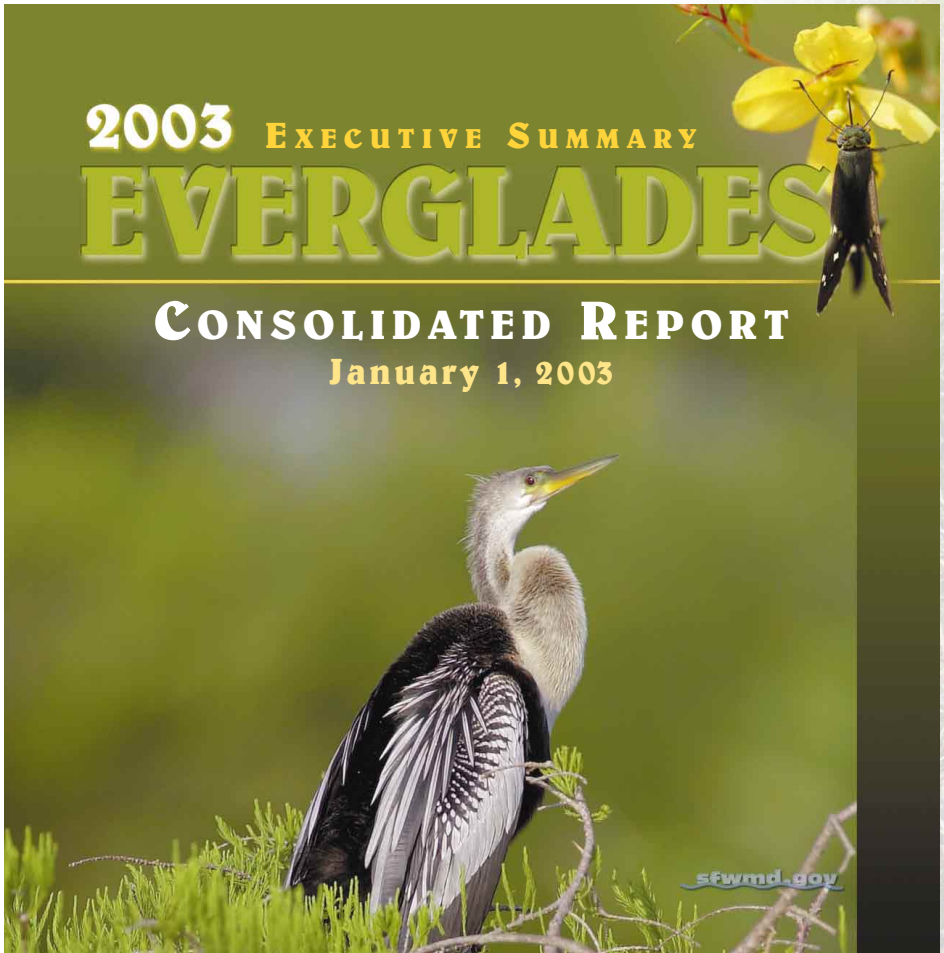
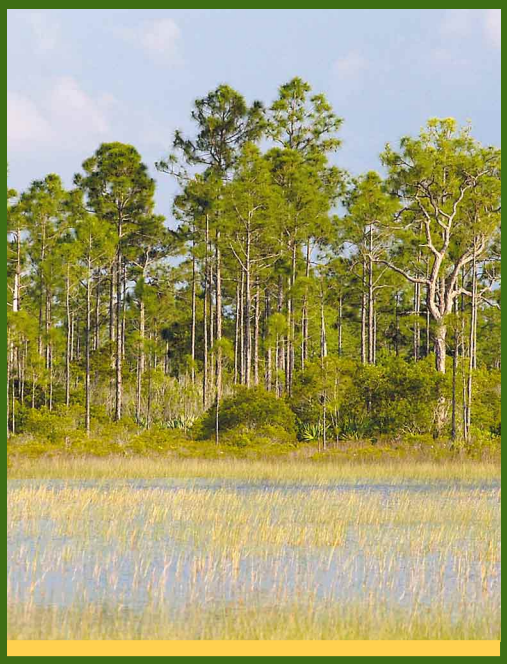
www.sfwmd.gov/org/ema/everglades

On the cover: anhinga and butterfly photo by Patrick Lynch, SFWMD





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